HOW TO REDUCE AIR & ENVIROMENTAL POLLUTION IN KABUL CITY

Dissertation submitted to Swiss UMEF University
in partial fulfillment of the award of the
Degree of Master of Business Administration
In
Public Administration

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MARCH-2016

AIR AND ENVIRONMENTAL POLLUTION, A BIGGER KILLER THAN WAR IN KABUL

DECLARATION

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I, Aashiqullah Zazai hereby declares that my MBA dissertation entitled ***"HOW TO REDUCE AIR AND ENVIROMENTAL POLLUTION IN KABUL CITY"*** is the original work executed in a period of four months regular research under direct supervision of Dr. Alavi (Mentor), this is the final version of my thesis research after numerous modifications, appliance of changes, corrections and adjustments. By submission of this thesis proposal I would like to grant below authorities to Umef University:

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This is to certify that Mr. Aashiqullah Zazai is a bona fide student pursuing Master of Management Science course in the Faculty of Management Science of SWISS UMEF UNIVERSITY OF AFGHANISTAN. The dissertation entitled ***"How to Reduce Air and Environmental Pollution in Kabul city"*** is conducted under my guidance, and submitted by him, in partial fulfillment for the completion of Master of Master of Business Administration. Degree offered by the SWISS UMEF UNIVERSITY OF AFGHANISTAN.

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ACKNOWLEDGMENT

After a fully concentrated period of four months now is the day of Thanks Giving! It has been a great learning and experienced time for me, this research has had a great impact on my knowledge and understanding. I would like to thank all those who supported me throughout different stages of this thesis proposal.

Firstly, I would like to express my sincere gratitude to my mentor Prof/Dr. Alavi for the continuous support of my MBA study and related research, for his patience, motivation, and immense knowledge, his guidance helped me in all steps. I want to thank Kabul Municipality personnel, Ministry of Urban Development officials, Governmental Agencies designees, International Agencies staff and other firms' associates who have provide all necessary information on timely and quality manner. In addition, I would like to thank my close friends and all individual who have allowed me to conducted personnel interviews with them, who has completed the thesis questionnaire forms, shared their ideas and opinions about the solutions of the air and environmental problems in Kabul city.

I am using this opportunity to express my gratitude and highest appreciation to everyone who supported me and contributed to my study throughout the research of this important project which has direct impact on the health of public. I am thankful for their aspiring guidance, invaluably constructive criticism, motivation, courage, energy, regular information and clarification during the overall research.

This thesis proposal / book is dedicated to all students at Swiss Umef University, my family and friends, Afghan government environment control agencies and public.

EXECUTIVE SUMMARY

The city of Kabul suffers from poor air quality and overcrowding. In recent years, the ambient air quality in the city has deteriorated so much that it can be ranked among the dirtiest cities in the world. The once unlimited visibility in the 1980s is down to less than a hundred meters in most days. The Qurugh, Paghman and Shomali Plain mountains that once were part of the beautiful snow caped landscape of the city are very rarely visible due to unclean air and dirty environment, this research has been made to focus on overall air and environmental management problems, find exact facts and reasons and offer proper solutions to control the air quality and environment so the public can breathe pure air and live in environmental without disease and bacteria.

For the residences of the city, a breath of fresh air cannot be purchased for any price in most days of the year. To watch the city landscape from an advantage point, it looks like it has caught fire. There are numerous carcinogenic compounds that are emitted to the air as a result of burning tires, plastic, used motor oil, and other substances.

Population density in Kabul is high and most of the hills and mountain tops are occupied by houses that are lacking sanitation and access to clean water. During the rain and snow, the urban runoff saturated with human waste, dirt, and soil is transported down the hills to the streets below. The mix is ground by passing traffic to a very fine powder and once dry, it is airborne by the wind and moving traffic.

This study estimates the levels of air pollutants from several sources in Kabul by using the United States and other developed nations environmental protection agencies guidelines. In the absence of adequate air quality monitoring stations in Kabul to collect air pollution data, this approach seems to be useful for strategizing and implementing a sound air quality improving program. Numerical values on air pollutants obtained from this study should help the policy makers and the international organizations involved in reconstruction of Afghanistan. Also, this study will hopefully facilitate the officials of the Afghan government in comprehending the magnitude of deterioration of ambient air quality in Kabul. This decreasing air quality is leading to a significant detrimental health effect on the community. Estimating air pollutants

level was undertaken by using actual statistical data on the sources of air pollution and reasonably estimating other parameters.

Calculations show dangerous levels of PM 2.5, PM10, Pb, and other pollutants. The calculated level of lead in Kabul, where almost one fifth of the Afghan population live and a large international community is present, reaches dangerous levels and can adversely affect the learning capabilities of the children and future generations of the country. A higher concentration of Pb used in leaded gasoline and emitted from burning used motor oil, is more dangerous than any war and is capable of causing learning disabilities among the Afghan children. Because children's developing bodies absorb lead much easier than adults, lead exposure is more serious and they are much more susceptible to its harmful effects. Even at low or moderate levels, lead exposure may harm the intellectual development, behavior, growth and hearing. At high levels, lead can cause permanent brain damage and even death .The impact is going to be devastating by further widening the gap between the population of Afghanistan and the rest of the world in progress and advances in science and technology. The following is a brief discussion of major sources of air pollution in Kabul, the health effects of air pollutants, and as much as it is possible, estimate of air pollutants concentrations.

Details of calculation are not discussed because the scope of this paper was to raise the public awareness and draw attention of policy makers on the dangers that air pollution can pose on public health. However, the author is open to share all the facts, formulas, and methods used in this study with interested parties and individuals and will welcome any suggestions and critical comments.

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ACRONYMS

KM	Kabul Municipality
MOUD	Ministry of Urban Development
NEPA	National Environmental Protection Agency
MOH	Ministry of Health
MOF	Ministry of Transportation
WHO	World Health Organization
ARG	Presidential Palace
ANDS	Afghanistan National Development Strategy
MOF	Ministry of Finance
MOT	Ministry of Transportation
KMDP	Kabul Municipality Development Program
DM	Deputy Ministry
AISA	Afghanistan Investment Support Agency
BPHS	Basic Public Health System
GDP	General Directorate of Policies
GDPU	General Directorate of Special Police Units
GTEC	General Training & Education Command
IDLG	Independent Directorate of Local Governance
IED	Improvised Explosive Device
IOM	International Organization for Migration
LOTFA	Law and Order Trust Fund for Afghanistan
MoIA	Ministry of Interior Affairs
MPAD	Media and Public Affairs Directorate
NATO	North Atlantic Treaty Organization
NCC	National Consultative Council
NGO	Non-governmental Organization
NPS	National Police Strategy
PCC	Provincial Consultative Council
PCOP	Provincial Chief of Police
QRF	Quick Reaction Force
SPD	Strategic Planning Directive
UNDP	United Nations Development Program
AFN	Afghani Currency

CHAPTER 01 – INTRODUCTION AND OVERVIEW

1.1 Air and Environment Quality in Kabul City

Kabul, Afghanistan's capital, a city built for half a million people, the wartime population has swollen to six million (Approximately). Only 5 percent of Kabul's homes are connected to actual sewerage systems, while most household waste flows straight into open roadside drains. Often their effluvia do not make it far enough to join the floating hypodermic needles and assorted muck of the Kabul River. A city with weak master plan, weak construction management system, rough roads and streets. A city with very weak infrastructure system. Kabul is losing at-least 3,000 citizens affected by air and environmental pollutions and thousands are affected by air and environment pollution diseases annually.

In contrast to many other big cities of the world, Kabul has not made any major effort to reduce air pollution. Recognizing that transportation is a major pollution source in Kabul, any strategy that geared to reduce or control atmospheric pollution has to include a transportation improvement program. The main programs to combat air pollution in the Kabul that need to be considered but not limited to include:

1. Transportation improvements

a. control the number of private cars

b. prohibit the import of old cars,

c. impose high tax on gas guzzlers,

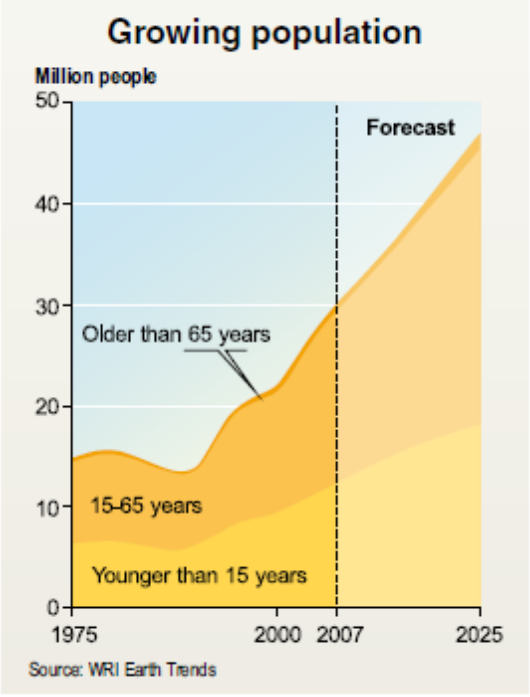
d. promote public transportation,

e. encourage carpooling and telecommuting

f. strictly control quality of imported fuels, promote the use of low sulfur diesel,

g. Introduce the use of catalytic convertors to reduce exhaust emissions

h. control engine conditions. Since incomplete combustion in old or poorly maintained engines is a direct cause of carbon monoxide and unburned hydrocarbon emissions, the enforcement of engine maintenance standards should be another goal of traffic. The major compulsory program implemented in this direction in other countries for



example the United Sates is called the Inspection and Maintenance Program. It is a costly program, however, in Kabul this process can be simplified by authorizing traffic inspectors to stop smoking vehicles until they have been repaired and do not smoke any longer. Reduction of lead and sulfur in fuels and finally the introduction of catalytic converters will drastically reduce pollution.

2. Intensify pavement of dirt roads.

3. Populate the dusty roads, vacant areas, and parking lots by those trees and shrubs that are native to the area this should significantly reduce emissions of dust by traffic and winds.

4. prohibiting the burning of scrap tires, used motor oil and plastic (impose a bounty on plastic bags, for example, 2 afs/bag.) will result in better air quality for the people of Afghanistan.

5. Pass legislation to obligate the mass media to launch extensive environmental campaign on pollution prevention topics for free. After all, they make money by using public air space.

6. Institute a dynamic program in schools of the country at all levels and educate the future generation of the country on the health effects of air pollution and pollution prevention, conservation, and recycling.







1.2 PROBLEM STATEMENT

A very dangerous public problem in Kabul city is the un-clean air to breathe with dirty environment, the living standards in Kabul city is extremely weak, risky and un-acceptable, no proper waste management is on place, there is no air control, no public awareness and upgrading programs are implemented to avoid continuously risks to the public health. The city of Kabul suffers from poor air quality and overcrowding. In recent years, the ambient air quality in the city has deteriorated so much that it can be ranked among the dirtiest cities in the world. The once unlimited visibility in the 1980s is down to less than a hundred meters in most days. For the residences of the city, a breath of fresh air can not be purchased for any price in most days of the year. To watch the city landscape from an advantage point, it looks like it has caught fire. There are numerous carcinogenic compounds that are emitted to the air as a result of burning tires, plastic, used motor oil, and other substances.

The main causes of air quality deterioration are:

- Very dusty roads
- The use of many old and smoking vehicles
- Burning plastic, used motor oil, and tires as a source of fuel
- Urban sprawl
- The bowl shaped landscape of the city surrounded by the mountains which trap air pollutants and promote inversion
- The use of leaded gasoline
- The use of 2-cycle electric generators
- Generation of electricity by firing diesel generators
- Using coal and wood for heating and cooking
- Cutting trees, shrubs, and native bushes
- Lack of care from the public

Population density in Kabul is high and most of the hills and mountain tops are occupied by houses that are lacking sanitation and access to clean water. During the rain and snow, the urban runoff saturated with human waste, dirt, and soil is transported down the hills to the streets below. The mix is ground by passing traffic to a very fine powder and once dry, it is airborne by the wind and moving traffic.

This study estimates the levels of air pollutants from several sources in Kabul by using the United States and other developed nations environmental protection agencies guidelines. In the

absence of adequate air quality monitoring stations in Kabul to collect air pollution data, this approach seems to be useful for strategizing and implementing a sound air quality improving program. Numerical values on air pollutants obtained from this study should help the policy makers and the international organizations involved in reconstruction of Afghanistan. Also, this study will hopefully facilitate the officials of the Afghan government in comprehending the magnitude of deterioration of ambient air quality in Kabul. This decreasing air quality is leading to a significant detrimental health effect on the community. Estimating air pollutants level was undertaken by using actual statistical data on the sources of air pollution and reasonably estimating other parameters. Calculations show dangerous levels of PM 2.5, PM10, Pb, and other pollutants. The calculated level of lead in Kabul, where almost one fifth of the Afghan population live and a large international community is present, reaches dangerous levels and can adversely affect the learning capabilities of the children and future generations of the country. A higher concentration of Pb used in leaded gasoline and emitted from burning used motor oil, is more dangerous than any war and is capable of causing learning disabilities among the Afghan children. Because children's developing bodies absorb lead much easier than adults, lead exposure is more serious and they are much more susceptible to its harmful effects. Even at low or moderate levels, lead exposure may harm the intellectual development, behavior, growth and hearing. At high levels, lead can cause permanent brain damage and even death. The impact is going to be devastating by further widening the gap between the population of Afghanistan and the rest of the world in progress and advances in science and technology. The following is a brief discussion f major sources of air pollution in Kabul, the health effects of air pollutants, and as much as it is possible, estimate of air pollutants concentrations.

Details of calculation are not discussed because the scope of this paper was to raise the public awareness and draw attention of policy makers on the dangers that air pollution can pose on public health. However, the author is open to share all the facts, formulas, and methods used in this study with interested parties and individuals and will welcome any suggestions and critical comments.

Air Emissions Calculations

1. Particulate Emissions from Road Traffic

According to the Kabul Traffic Administration and Afghanistan's National Environmental Protection Agency (NEPA) there are more than 300,000 passenger cars and 100,000 trucks operating in Kabul. The United States Environmental Protection Agency (US EPA) guidelines

and US Department of Transportation (USDOT) calculation methods were used to calculate emissions of particulate matter from traffic on public roads in Kabul (1) and (2) . Furthermore, a 250, 500, m thickness of the polluted air and an area of 4082 Km2 for the Kabul air shed were assumed (data from NEPA) and concentrations of PM2.5 and PM10 were calculated for different atmospheric levels (Table 1). For simplicity, distribution of air pollutants within the air strata was assumed uniform.

Table 1. Particulate Emissions Attributed to Moving Traffic in Kabul

Polluted Atmosphere Thickness, m	**Air Pollutants Concentrations µg/m^3**	
	PM $_{2.5}$	**PM$_{10}$**
500	39.46	396.32
250	78.92	792.67

The reason for selecting different levels in the model is that the polluted air vertical distribution is not knows in Kabul and even on higher mountains surrounding the city, air pollution is present. As it is seen from Table 1, the yearly average concentrations of PM2.5 is calculated at 39.46 µg/m3, two and half times more than the EPA standard of 15 µg/m3 (3). If a 250 m thick layer for distribution of PM2.5 is assumed, then the yearly exposure level will be 78.92 µg/m3, more than five times of the EPA standard.

Generally, particulate matter of 10 µm and smaller are readily inhaled and due to their very fine sizes, the upper respiratory defense mechanism can not scrub them and they penetrate deeply into the alveolar section of the lungs and eventually to the cardiovascular system where they can cause adverse health effects such as stroke, lung cancer, brain damage, respiratory, cardiovascular, heart, circulatory diseases, and damage to the unborn child. To appreciate the magnitude of estimated particulate matter emissions in Kabul by moving traffic, refer to Table 2.

Table 2. Total annual emissions of Particulate Matter Triggered by Moving Traffic

Particulate Emissions Attributed to Moving Traffic in Kabul			
PM$_{2.5}$ Emissions		**PM$_{10}$ Emissions**	
t/y	t/day	t/y	t/day
24564.41	80.53	246724.5	808.92

The lack of energy such as gas and electricity are the other reasons that add to the density of weather pollution in Kabul. The people are compelled to cut the trees, burn plastics and tires for warming the residences in the winter and cooking purposes. Moreover, electricity shortage

in the city has caused the use of power generators and the generators, of course, use third class substandard fuels that are producing and contributing to the air pollution, and creating noise. According to a survey report by NEPA (National Environmental Protection Agency), "Kabul has lost up to 70 percent of its greenery since 1980's," due to lack of enough gas and electricity and the people are burning wood as an alternative to gas and electricity.
Most of the cities were partially destroyed during the civil war, but Kabul was completely demolished. There was no part of the city which was not affected. Many NGO's and nonprofit organizations have rushed into Kabul and are working for the reconstruction of the city, since the Taliban's government collapsed and the transitional government formed under the leadership of Mr. Hamid Karzai in 2002.

The construction projects, unpaved roads and streets are another pollution contributor to the air quality of Kabul. Most of the under-construction roads and streets are adding to the air pollution, these projects have created traffic problems in city as well. Moreover, destroying the green areas and building nonstandard sky scrapers is a warning for contributing to the air pollution density and population increase in Kabul city.

Air pollution in Kabul is the result of three decades' civil war in Afghanistan. Civil war has completely demolished the infrastructure of the country. As a result, the nation is tolerating different sorts of problems such as pollution, security threats, unemployment, poverty and illiteracy. All the mentioned dilemmas are highly considerable issues, but the environmental issues and air pollution are negatively threatening the daily life of citizens, especially in Kabul city which is the most populated city in the country.

The geographical situation of the city is another cause of air density, because it is surrounded by mountains and hills which are dry and covered by residences. Most of the residences are lacking sanitation systems. Lack of access to proper sanitations and curving wells of sanitations have completely damaged the underground water. Most of the citizens do not have access to clear drinking water, and are suffering from certain diseases stretched in the air of Kabul.

According to a survey report by the Ministry of Public Health (MoPH) in 2009 published in www.irinnews.org website, "Air pollution in Kabul is causing respiratory diseases that may be hastening the death of around 3,000 every year." The statistics in this report indicate that the

number of lives being lost due to air pollution in Kabul is more than the deaths being caused by the terrorist acts, road accidents and natural death.

Citing Afghanistan's National Environmental Protection Agency (NEPA), National Public Radio, a non-commercial news website, "the level of nitrogen dioxide (NO2) was 52 ppm (Parts Per Million) on an average day in Kabul in 2008." On the other hand, the US Environmental Protection Agency (EPA) investigation result indicates that the air quality standard for NO2 (annual average concentration) is 0.053 ppm in Kabul." "The level of sulfur dioxide (SO2) was 37 ppm on an average day in Kabul in 2008." "The US EPA says the 24 hour average concentration of SO2 should not exceed 0.14 ppm. As the US EPA, exposes to NO2, SO2 and particulate matter negatively affects the respiratory system, damages lung tissues, and can cause cancer and premature death. The elderly, children, and people with chronic lung disease, influenza or asthma tend to be especially sensitive to effects of particulate matter."

The investigation report results by different sources such as MoPH, NEPA and US EPA indicate that terrorism, road accidents, and natural death are not the only enemy of the Afghan people. In addition, they are tolerating and fighting against another silent enemy such as air pollution. Air pollution has become more dangerous enemy of Afghan citizens than any other ones. It threatens thousands of lives in a year. Though, the government has developed strategies and has formed organizations such as NEPA to overcome this dilemma, it has not been able to achieve the targeted goals due to lack of security, enough budget, administrative capacity, and public co-operation.

It is every individual citizen's humanitarian responsibility to co-operate with the government in every aspect to overcome this dilemma and enjoy a life free of silent enemy such as air pollution and terrorism activities. The government is helpless to approach a conclusion in fighting against the silent enemy (air pollution) and terrorists, unless the people co-operate with their government. In Kabul, Afghanistan’s capital, a city built for half a million people, the wartime population has swollen to five million. Only 5 percent of Kabul’s homes are connected to actual sewerage systems, while most household waste flows straight into open roadside drains. Often their effluvia do not make it far enough to join the floating hypodermic needles and assorted muck of the Kabul River. Thanks to decades of drought, the stuff dries out and becomes part of this place’s ubiquitous dust.

When the United Nations Environment Program did a study that included air sampling, in 2008, it found plenty to worry about, but mostly what would be expected of a traffic-congested city:

a lot of sulfur dioxide and nitrous oxides. Plus a very high concentration of particulates, known in the trade as PM 10 — which means particles smaller than 10 microns, small enough to penetrate deeply into the lungs, and an important indicator of air pollution — but no specific fecal bits.

Kabul's geography is a big part of that: the city sits on a 6,000-foot-high plateau that looks like the bottom of a bowl, encircled by much taller mountains. The result is atmospheric inversions during fall and winter that trap airborne pollutants. Dust in dry places like Kabul is a major pollutant. It is not unusual to see police officers and pedestrians here wearing face masks as protection. Beijing, for comparison, on a bad day has a PM 10 count of 250, and it averages 121; the average across the world is roughly 71, according to World Health Organization statistics. So Kabul, with an average of 190, is worse than the Chinese capital based on PM 10 count alone. (Researchers, however, say there are other pollutants in Beijing's air that add to its specific danger.)

It is a deadly serious problem for Afghanistan's capital. The Asian Development Bank report calculated that such a level of air pollution — even without feces on the fly — would result in 600,000 additional asthma attacks annually and lead to an "excess annual mortality" of 2,287 in Kabul. That means that Kabul's atmosphere is more than twice as big a killer of civilians as the war; civilian casualties in the conflict that same year were 1,400 — in the entire country.

1.3 MAIN OBJECTIVES

The main objectives of my research are to find proper solutions on how to reduce the air and environmental pollution in Kabul city, Kabul is the most important city and capital for most educated and modern people of Afghanistan, the city needs to have international standards for life. I will set and discuss with different governmental departments to find out all previous plans and strategies that have been applied and recommended for Kabul city to reduce the air pollution, why those plans are failed? How can we help the public to live in a better environment? Beside to my local research I will conduct a survey of all neighborhood capitals and collect all useful and modern technologies and ideologies that are recently in use to keep the city clean and fresh. I have categorized my research objectives as below:

- Find solutions for environmental cleanup.
- Implement a useful infrastructure master plan.

- ❖ Avoid import used vehicles/equipment/material.
- ❖ Provide and recommend internationally accepted Air and Environmental Pollutions Policies and Strategies.
- ❖ Reduce Air and Environmental Pollutions in Kabul city.
- ❖ Improve access to clean and safe water.
- ❖ Promote material management, waste management and clean the city.
- ❖ Enhance Joint Preparedness for Environmental Response

1.4 – RESEARCH QUESTIONS

There are hundreds of questions with the public, agencies, organizations and international health groups on how to reduce the air and environmental pollution, clean up the dirt, trash and keep the environment in accordance to living standards in Kabul city but due to limitations I have mainly focused on below questions during my research, I have conducted personal interviews with 20 governmental officials, experts and professionals who live in Kabul city knowing entirely about the air and environmental pollution, I have attached their views and ideas about the current ongoing situation and proper solutions in the end of this thesis proposal:

1. What is Air and Environmental Pollution?
2. How does Air & Environmental Pollution affect health of public?
3. What is Air Quality?
4. What are some of the major sources of causes of air pollution in Kabul city?
5. What are possible ways to reduce Air and Environmental Pollution in Kabul city?
6. Who is responsible for Air and Environmental pollution in Kabul city?
7. How to control Air and Environmental Pollution in Kabul city?
8. What does the government needs to do to control the defects occur to public by Air and Environmental Pollution in Kabul city?
9. What are public policies that can reduce the health impacts of ambient air pollution?
10. What challenges do countries face, and what obstacles are preventing assistance in improving ambient air quality?
11. What can we do to reduce Air & Environmental Pollution?
12. Why other capitals are clean?
13. What is the rule of society in cleaning Kabul city?
14. What can people do in order to reduce air pollution?
15. What has international agencies did in 14 years to reduce air pollution in Kabul city?

16. Why is the master plan for Kabul city un-disciplined and mismanaged?
17. What is immediate solution to reduce air and environmental solution in Kabul city?
18. What steps are required in long term to reduce air and environmental pollution in Kabul city?
19. What does Kabul municipality do on daily basis to keep the city clean?
20. Is Kabul municipality and other relevant agencies successful to keep the city clean?
21. What will be the main objectives and requirements to reduce air and environmental pollution in Kabul city?
22. Why are public and government silent about air and environmental pollution?
23. Why will be impacts of dirty air and environment on short and long terms?
24. Should we consider the government failed on reduction of air and environmental pollution in Kabul city?
25. What is particulate matter?

1.5 Hypothesis

- WILL state how badly the current air and environmental pollution effect the public health.

Air quality in Kabul has been adversely affected by vehicular emission (diesel and gasoline); poorly maintained engines; adulterated fuels; burning of vegetation and other biomass for heating, cooking, and bathing; burning of refuse; and operation of brick kilns fired by a variety of fuels, including wood and scrap tires, putting trash everywhere on streets, dirty and rough roads and Kabul city streets. Impaired air quality has a negative impact on public health and welfare and poses a significant burden in economic and social costs. The Afghanistan Government had yet to formulate a coherent Air Quality Management (AQM) strategy and baseline air quality and emissions data did not properly exist, no significant activities had been held to raise public and government awareness about the harmful impact of air pollution, and no policy of AQM had been developed. Kabul city has its topography and climatology resulted in serious and prolonged atmospheric inversions during fall and winter.

If the current environmental and air pollution continues this will badly cause several disease and sickness to the health of local residents, the current city environment is very dangerous and the public health risks are increasing on daily basis, if the government don't pay immediate

attention to manage the air and environmental pollution the biggest cause of public deaths in Kabul city will be the air and environmental pollution.

The Kabul city's master-plan is for specific areas, it's not properly implemented and very weakly managed by the governmental agencies, over 75% of residential houses and commercial areas in Kabul city are not under the master plan. Due to the huge amount of frustration and corruption within the government, everyone is allowed to build anything anywhere in any governmental or public areas by dealing with officials. This process is also one of the causes of dirty environment in Kabul city.

The government can easily return the clean air and environment by implementing and following certain steps toward integrity, honesty and loyalty to the public. The certain steps are including to privatize the air and environmental management of every district, the government should hire local cleaning companies for every district for immediate solution, all contracts with private companies should be signed very professionally to include the overall cleaning, management and reduction of air and environmental pollution. The government should just inspect and verify the process on daily basis, rate qualified contractors for extensions and eliminate all or any who can't accomplish the government and public's expectations.

Once the contracts are signed with local companies, the government will then have enough time to plan, review and execute long term strategies to manage the city in a cost effective manner with most professional and modern city management methodology, it's possible both with privatization or government control.

WILL state that the air quality and environmental pollution influences, causes and solutions in Kabul city

According to National Environmental Protection Agency (NEPA), "over 70 percent of diseases in Kabul are linked to air pollution, unclean water and solid waste" and "over the past few years diagnosed cases of cancer . . . have increased considerably."

Causes of air pollution:

- No Proper Management of Trash
- Loss of greenery
- Substandard fuel and old engines in vehicles
- Use of wood, coal and heating oil for household cooking
- Businesses/factories burning tires and plastics for fuel

1.6 Environmental Governance in Afghanistan

The past years we have seen some achievements in the field of environmental governance. The National Environmental Protection Agency (NEPA) was established in 2005 as Afghanistan's environmental policy-making institution, tasked with regulation, coordination, monitoring and enforcement. With technical assistance from the United Nations Environment Program, Afghanistan's first Environment Law was drafted further to a consultative process and signed by the President in late 2005. It was then reviewed and amended by the (then newly-established) National Assembly, and the final version was promulgated in early 2007 (Official Gazette No. 912, 25 January 2007). In addition, with support from the international community, several projects targeting various aspects of capacity building and environmental assessment, clean-up nd restoration have been implemented, and important international environmental conventions and cross border cooperation agreements signed. In 2008 adoption of the Afghanistan National Development Strategy (ANDS), which among priority issues and sectors lists environmental management and conservation, will be an essential step forward.

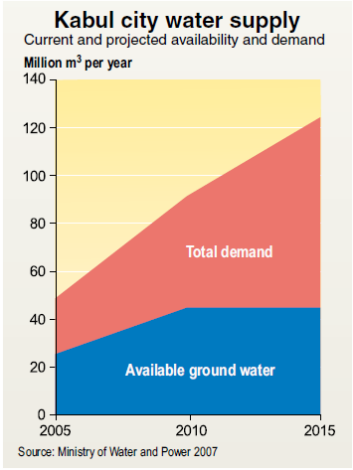
Within ANDS, NEPA is expected to play an important role in environmental protection. However, its mandate extends further: under the Environment Law it is responsible for fulfilling 18 key functions related to the environment and natural resources. In the years to come NEPA will consequently be one of the central institutions dealing with management of Afghanistan's environment for the benefit of all Afghan people, alongside other sectoral ministries such as the Ministry for Agriculture, Irrigation and Livestock (MAIL), the Ministry of Energy and Water (MEW), and the Afghanistan National Disaster Management Authority (ANDMA).

The new Environment Law of Afghanistan is based on 13 fundamental principles. It consists of nine chapters and 78 articles addressing all the main environmental concerns. For example, chapter 4 addresses the regulatory provisions for pollution control and waste management; chapter 6 focuses on biodiversity, conservation and management of natural resources. Overall, the law defines the functions and powers of NEPA and reflects the role of the agency as the apex body for the formulation, implementation, regulation and monitoring of Afghanistan's environmental policies and also as the coordinator for international environmental cooperation. To promote further integration and coordination of environmental matters with other government agencies, the Environment Law has established Afghanistan's Committee for Environmental Coordination and the National Environmental Advisory Council.

Afghanistan's environmental policies are steadily improving. The National Capacity Needs Self-Assessment for Global Environmental Management (NCSA) and National Adaptation Program of Action for Climate Change (NAPA) projects, completed in February 2008, provide an excellent overview of Afghanistan's progress towards implementing UNFCCC (Climate Change Convention), UNCBD (Biodiversity Convention), and UNCDD (Desertification Convention), and its overall position in the international environmental arena. The National Environmental Strategy of Afghanistan, developed by NEPA in 2007 as part of the ANDS process, clearly demonstrates the cross-sectoral perspective of environmental management. It also proposes specific activities and considerations to meet national targets for the Millennium Development Goals (MDGs). Assessment of ozone-depleting substances has helped to define the weight of Afghanistan in the global impact on Earth's ozone layer. Very comprehensive work has been carried out to assess Afghanistan's biodiversity, ecological hotspots and conservation potential, while developing recommendations for strengthening the network of protected areas and supporting community-based natural resource management. The new approach to environmental policy is designed to address the cross-sectoral character of the use of natural resources, as well as the underlying causes of environmental degradation.

1.7 Water resources:

Mountains are vital "water towers" for Afghanistan and the Central Asian region as a whole. However, climate change, the resulting melting of mountain glaciers, severe droughts and poor management of water resources are threatening water security. War-inflicted damage to large and small irrigation systems, and the disruption of water supplies have reduced the accessibility of this essential resource. However, rehabilitation projects and river basin management initiatives are being implemented and are addressing the water problems. New legislation is being passed, backed by the appropriate institutions. Cross-border environmental cooperation on water resource management and hydropower is gradually taking shape. Improved access to safe drinking water for the urban and rural population is an important priority.

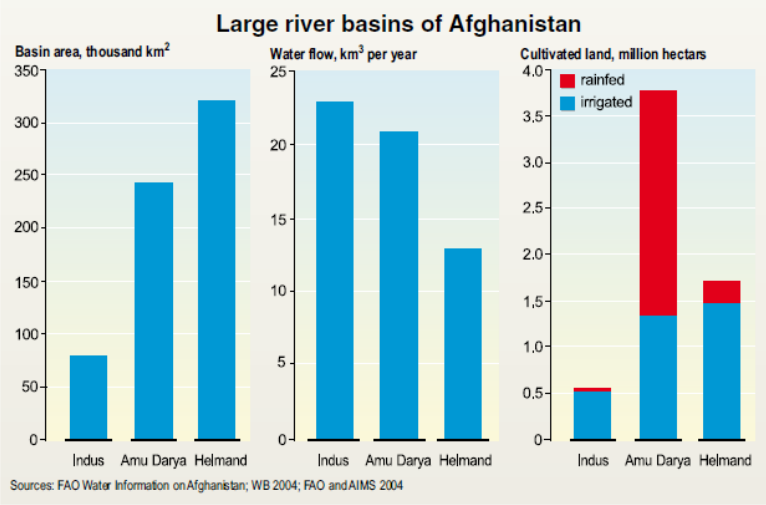


Water is the country's most critical natural resource and key to the health and wellbeing of Afghan people. In Afghanistan, as in the rest of the world, the availability of, access to and quality of water (or its absence) can also be a source of conflict or a driving force for migration. As Afghanistan has an arid climate, water resources are scarce, particularly during drought periods. More than

80 per cent of Afghanistan's water resources originate in the Hindu Kush Mountains at altitudes above 2 000 metres. The mountains operate as a natural storage facility and source of water through the accumulation of snow during winter, snow melt and rainfalls during spring, and release of frozen water from glaciers in summer sustaining the vital flow in rivers. The Amu Darya River basin, which is shared with Tajikistan, Uzbekistan and Turkmenistan, covers approximately 15 per cent of the surface area of Afghanistan and holds more than 55 per cent of country's water resources. The basin has the largest potential for irrigated agriculture and hydropower. In contrast the Helmand River basin, which covers some 45 per cent of Afghanistan, contributes only about 10 per cent of the country's total water resources.

Afghanistan's irrigated land and gardens (3 million hectares) account for the bulk of agricultural produce. An additional 3.5 million hectares are used for non-irrigated production, which is dependent on rainfall. Together they play a major role in the country's economy, with agriculture accounting for more than half of GDP. Similarly more than 80 per cent of the population is engaged in agriculture, including livestock-raising. The country is consequently extremely vulnerable to water shortages. About 20 cubic kilometres is used for irrigation and drinking per year. This includes 85–90 per cent of water taken from surface sources, and 10–15 per cent from below the ground. Agriculture uses almost 99 per cent of the water, primarily from rivers and streams, followed by springs, kareze, shallow and deep aquifers. The use of water is likely to increase in the coming years due to growing demand from agriculture but also from urban centers and industries.

The total irrigated area has fluctuated over the past 30 years. By the mid-1970s, Afghanistan was almost self-sufficient for its food supply. Nearly 3.3 million hectares were cultivated using various methods of irrigation, representing approximately 85 per cent of the country's total crop production. This has dropped to about two million hectares due to unrest and war, droughts, flood damage, aggravated by the failure to operate and maintain irrigation systems at a community and national level. The total area under



irrigation is increasing again, but as much as a third of the total available land previously irrigated is not being cultivated due to water shortages. As a result the irrigation infrastructure has seriously deteriorated, and many farmers returning to their land cannot secure a reliable water supply to resume farming. Some provinces that rely heavily on ground water for irrigation – such as Ghazni, Helmand and Uruzgan – are particularly vulnerable, with drought and water shortages impacting directly on livelihoods.

At a larger regional scale, access to water resources in Central Asia, including Afghanistan, can often be both a source of local tension (individual and inter-communal disputes), and a source of friction in inter-state relations (irrigation-hydropower nexus, and the relations between upstream and downstream countries).

A series of recent droughts and increasing air temperatures have reduced the size of glaciers in Afghanistan, posing additional long-term problems due to climate change. In the past 50 years larger glaciers in the Pamir and the Hindu Kush Mountains have already shrunk by 30 per cent, while some smaller ones have vanished altogether.

More than 2.5 million people in Afghanistan are already affected by drought or are vulnerable to the impacts of recurrent drought and water shortages. The number may increase further due to global warming and further aridization.

In the last five years a dramatic decline in waterfowl has been observed on the Sistan Lakes, a transboundary water resource shared with Iran. In 2001 a severe drought stopped recharging of these wetlands and dried up the lakes, with predictably negative impacts on their ecology. Kol-e-Hashmat Khan is another degraded wetland near the city of Kabul. A combination of dry conditions and the diversion of water for irrigation and household use dried out this wetland. Urban settlements now occupy a large area of the partly dried-out lake. Drought and excessive extraction of ground water in the vicinity have affected the Ab-e-Estada and Dasht-e-Nawar lakes in Ghazni province.

About 31 per cent of Afghanistan's households currently have access to safe drinking water. Kuchi households have the lowest rate of access (16%), while the rates for rural and urban households are respectively 26 per cent and 64 per cent, on the basis of minimum requirements of 20 litres per day per capita for the rural population and 50 liters per day per capita for the urban population. Access to safe sanitary facilities (improved latrines) is available to only 5-7 per cent of households nationwide. Bacterial contamination of water sources is widespread,

increasing morbidity and mortality especially among children. Water resources in Afghanistan are being polluted due to indiscriminate disposal of untreated industrial and domestic effluents, and the discharge of household and street waste into streams. In some aquifers the concentration of hazardous chemicals exceeds hygienic standards.





In Kabul city, which is mostly supplied by ground-water sources (with hand pumps reaching shallow aquifers, and wells for deeper aquifers), water quality varies depending on the location. In some places the quality of ground water is acceptable; in others, the presence of pollutants makes it unsafe for consumption. The use of agrochemicals and the poor storage of pesticides can pollute surface and ground water alike. Afghanistan's participation in regional and global water partnerships will be soon a prerequisite for the future use of international waters. Afghanistan needs to develop an appropriate information base covering the quantity and quality of its water resources. It must also carry out a comprehensive assessment of current and future water needs and availability. This could be done in cooperation with neighbours through the exchange of data and expertise, and building of professional and inter-sectoral relations. Implementation of modern Integrated Water Resources Management (IWRM) principles and the establishment of functional river basin management institutions will help to respond effectively to the needs of users and the environment. Development of national water projects is one of the tasks of the Supreme Council for Water Affairs Management (SCWAM) recently established in Afghanistan. A draft Water Law has been developed and is in the legislative pipeline. At the time of writing, it was awaiting approval by the National Assembly.


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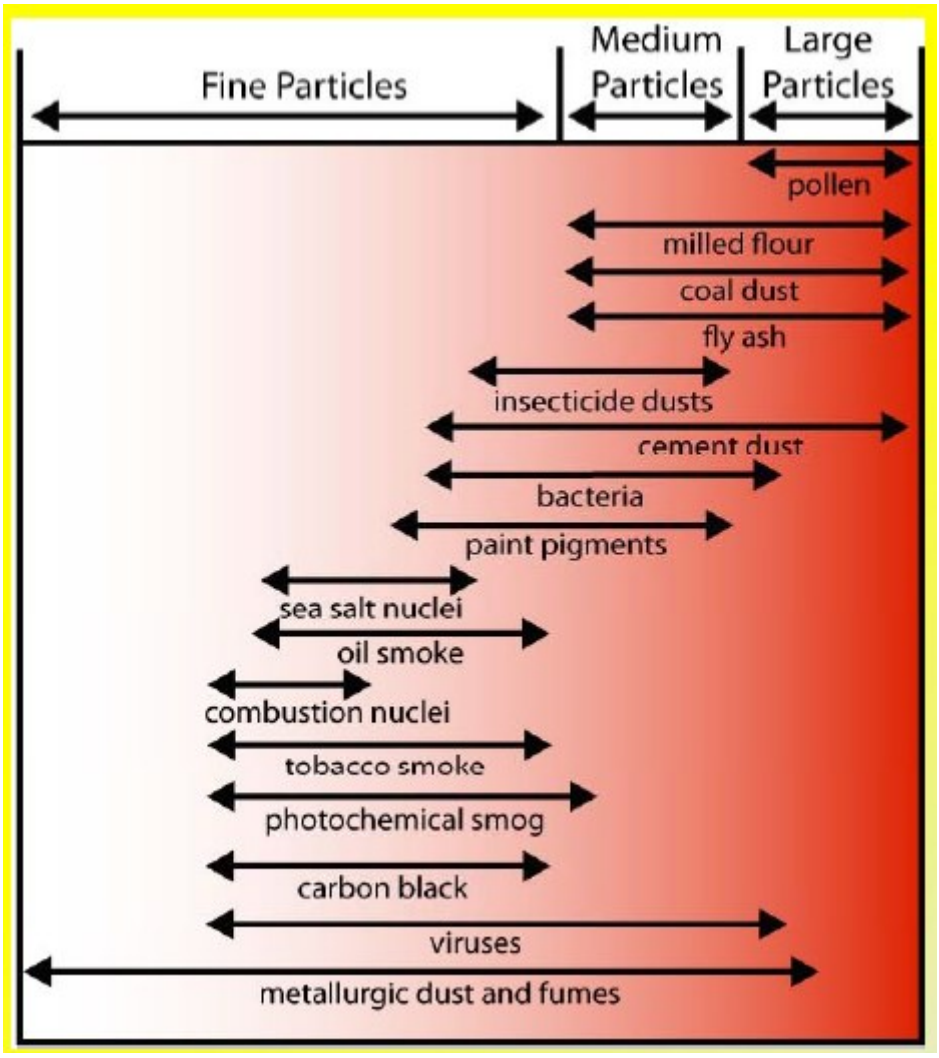


CHAPTER 02 – LITERATURE REVIEW

2.1 Surveys

Surveys and researches conducted by various Afghan governmental and international agencies in Kabul shows that the recent air and environmental pollution in Kabul city is out of control and is very dangerous for health of public. Reports data collected below says that:

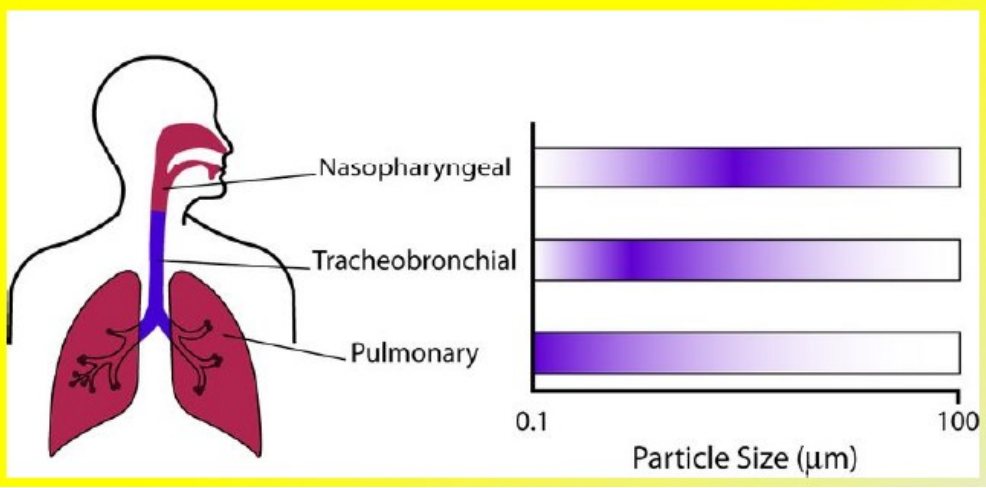
- Over 3,000 people die from air pollution and unsafe water in Kabul per year.
- 80% of Kabul's hospital patients suffer from air pollution.
- 900,000 vehicles in the city, 80% are older than ten years.
- Many roads are unpaved, creating dust and pollution.
- Afghanistan imports low-quality fuel ("dirty fuel“).
- From a sample of 200 patients 80% had high levels of lead in their blood according to the National Environment Agency.
- Kabul is rapidly growing, already over 5-6 million inhabitants.



2.2 FACTS BEHIND AIR AND ENVIROMENTAL POLLUTION

Main reasons behind Air and Environmental pollution in Kabul is weak government control on public constructions, facilities, fuel import, standards of living, weak Kabul infrastructure design, no focus on public canalization system and no drainage systems in the city:

- Kabul produces nearly 3,000 tons of solid waste/day - collection capacity = 400 tons; no solid waste disposal system;
- Weak drainage system and surface water system;
- Dry latrine for 85% of the houses;
- Septic tanks for approx.12% of the houses but majority of poor quality;
- Sewage System for only 3% of the houses.
- Very dusty roads
- The use of many old and smoking vehicles
- Burning plastic, used motor oil, and tires as a source of fuel
- Urban sprawl
- The bowl shaped landscape of the city surrounded by the mountains which trap air pollutants and promote inversion
- The use of leaded gasoline
- The use of 2-cycle electric generators
- Generation of electricity by firing diesel generators
- Using coal and wood for heating and cooking
- Cutting trees, shrubs, and native bushes
- Lack of care from the public



2.3 Emergency Commission

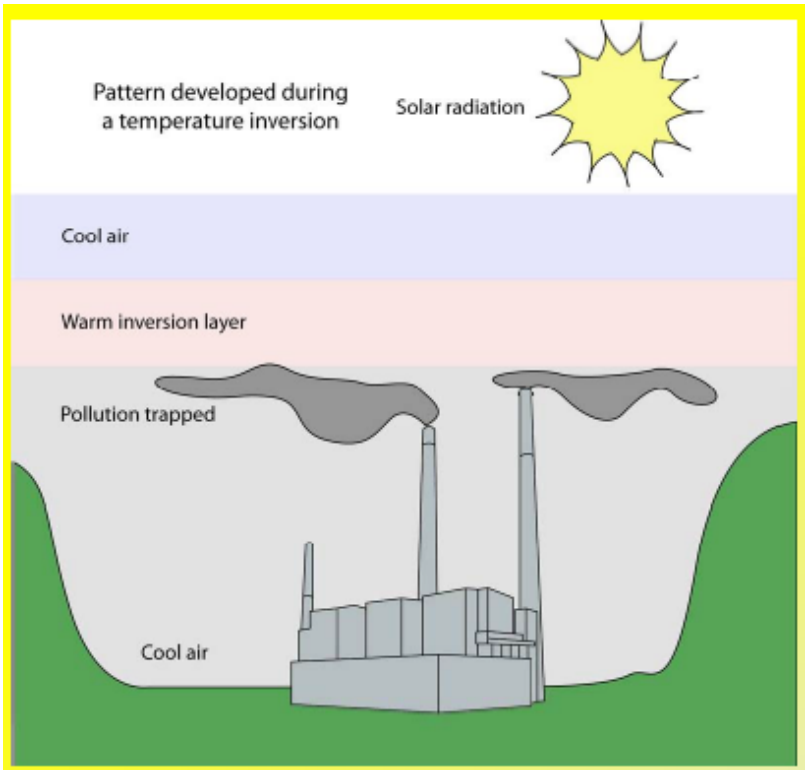
In response to the country's air pollution crisis, Ex-President Hamid Karzai has established under his stewardship an environmental protection emergency commission.

The commission is expected to bolster NEPA's activities and help implement much needed measures such as imposing curbs on the use of substandard fuel and old vehicles.

Afghanistan imports 5,000-6,000 tonnes of fuel every day but there is little or no supervision of its quality, according to the government. "Two or three days ago, we impounded 400 tonnes of bad quality fuel," NEPA's Baheer said.

With an annual budget of about US$2.3 million and over 460 staff nationwide, NEPA officials say they need international assistance to remedy the country's worsening environmental problems.

Kabul's sewage problem can to a great extent be solved by having low cost community septic or sewage tanks and by using Biomagic, a bio product from Chennai, India. Biomagic stops bad odor immediately on application, reduces BOD., COD and TSS levels, reduces the residual sludge volume without the aid of aerators, blowers, etc. No electricity needed. The treated water can be reused for gardening, irrigation, ground water recharging, golf course watering etc.



2.4 Total Calculated Air Emission in Kabul City

Pollutants	t/year	t/day	At 250 m thick layer, $\mu g/m^3$	Source
Acetaldehyde	0.01	$2.74x10^{-5}$	$2.68X10^{-5}$	Burning coal and wood
Barium (ppm)	0.165	$4.52x10^{-4}$	$4.43X10^{-4}$	Burning used oil
Benzene	4636.67	12.703	1.24	Burning used oil
Benzo(a)Pyrene	0.00186	$5.096x10^{-6}$	$4.99X10^{-6}$	Burning used motor oil
Cadmium (ppm)	0.248	$6.79x10^{-4}$	$6.66X10^{-4}$	Burning used oil
Carbon dioxide	1382424.09	3787.463	3710	Combustion of organic matter
Carbon Monoxide	145449.275	398.491	390	Combustion of organic matter
Chromium (ppm)	0.489	$1.34x10^{-3}$	$1.31X10^{-3}$	Burning used oil
Dioxin	$9.3x10^{-9}$	$2.54x10^{-11}$	$2.50X10^{-11}$	Burning coal and wood
Formaldehyde	0.03	$8.22x10^{-5}$	$8.05X10^{-5}$	Burning tires
Furans and dioxins	$1.53x10^{-8}$	$4.203x10^{-11}$	$4.12X10^{-11}$	Burning coal and wood and tires
Hexavalent Chromium	$1.05x10^{-5}$	$2.87x10^{-8}$	$2.82X10^{-8}$	Burning tires
Hydrogen Chloride	5.00	$1.37x10^{-2}$	$1.34X10^{-2}$	Burning coal and wood
Lead (ppm)	239.12	0.655	0.642	Vehicle exhaust, burning oil
Nickel (ppm)	0.099	$2.71x10^{-4}$	$2.66X10^{-4}$	Burning used oil
Organic Gases Total	10383.115	28.446	27.9	Automobile exhaust
Oxides of Nitrogen	7846.93	21.49	21.1	Automobile exhaust, combustion process
Oxides of Sulfur	3185.12	8.73	8.55	Automobile exhaust, combustion process
PAHs	69.72	0.191	0.187	Burning coal and wood
PCB's	$2.26E^{-6}$	$6.19x10^{-9}$	$6.07X10^{-9}$	Tire, wood and cool burning
PM_{10}	255592.3	700.25	852	Traffic movement, combustion processes
$PM_{2.5}$	30972.39	101.54	99.5	Traffic movement, combustion processes
Zinc	163.55	0.448	0.42	Burning used oil

2.5 Emission of Air pollutant from burning tires.

Air Pollutants	Emissions t/y	Emissions t/day
Total Organic Gases	7.35	0.02
Reactive Organic Gases	4.54	0.01
Oxides of Nitrogen	990.27	2.71
Oxides of Sulfur	109.19	0.30
Carbon Monoxide	714.38	1.96
Cabon Dioxide	33311.82	91.26
Total Particulate Matter	37.84	0.10
Particulate Matter (<10 Microns)	30.92	0.08
Acetaldehyde	0.01	$1.99x10^{-5}$
Benzene	0.01	$1.80x10^{-5}$
Formaldehyde	0.03	$7.66x10^{-5}$
Hydrogen Chloride	5.00	$1.37x10^{-2}$
Total Metals	0.03	$9.32x10^{-5}$
PAH	$5.68x10^{-4}$	$1.61x10^{-6}$
Hexavalent Chromium	$1.05x10^{-5}$	$2.88x10^{-8}$
Dioxin	$9.30x10^{-9}$	$2.55x10^{-11}$
Furans 59	$1.28x10^{-8}$	$3.50x10^{-11}$

2.6 Emission from burning wood and goal

In Kabul, fire wood and coal serve as important source of energy for cooking and heating. Approximately 2500 tons of wood is imported into Kabul daily for cooking and heating needs. However, in the winter for four months, approximately 1000 tons of coal is brought into Kabul every day. Based on calculations the total quantity of air pollutants from burning wood and coal is included in below table.

Fuel/ Pollutants	Air Emssions t/y	Air Emissions t/day
Particulates Total	21681.25	59.40068
PM_{10}	8372.75	22.93904
$PM_{2.5}$	6296	17.24932
Carbon Monoxide	67345	184.5068
Polycyclic Aromatic Hydrocarbons (PAHs)	69.7175	0.191007
Furans and dioxins	1.37225	0.00376
PCB's	$2.538x10^{-9}$	$6.95x10^{-12}$
Benzo(a) pyrene	$2.26x10^{-6}$	$6.18E-^{9}$
Benzene	4636.66	12.70318
Sulfur dioxide	2977.6375	8.157911

As can bee seen from the table, burning wood and coal can emit harmful concentrations of carcinogenic air pollutants such as benzene, PCBs, poly aromatic hydrocarbons (PAHs), furans and other harmful pollutants as carbon monoxide, sulfur dioxide, and nitrogen oxides in the close vicinity of people.

2.7 Emissions from Diesel Fired Electric Generation

Although in Kabul electric generation from burning diesel is phasing out due to import of electricity from the Central Asian Republics, nevertheless, it is estimated that around 50,000-100,000 Kw power is generated in various parts of the city by using diesel as fuel. Assuming that generators operate for 6 hours per day, 365 days per year, emissions of air pollutants were estimated (11) and are shown below table.

Emissions from a 200,000 Kw diesel power generators

Pollutants	Air Emissions t/y	Air Emissions t/day
PM2.5	105.07	0.29
PM10	105.07	0.29
SO2	98.29	0.270
NOx	1,494.65	4.095
VOC	118.62	0.325
CO	321.98	0.8825
CO2	216,372.00	592.8

2.8 Emissions from Burning Plastic bags, plastic bottles, and styrofoam

A few years ago, the people in Kabul and other parts of Afghanistan were using paper bags for shopping. Unfortunately, in recent years they have been replaced with plastic bags which have created serious environmental problems. It is a common practice in Kabul to burn plastic in public baths and houses for heating, and sometimes simply for getting rid of plastic waste. It is conservatively estimated that each person in Kabul uses about 35 g of plastic bags, bottles, and Styrofoam packing per week that eventually discarded and burnt. Assuming a million persons handle plastic, around 5 t/day of plastic is used in Kabul and later incinerated. Total CO2 emissions i estimated at 30 tons/day.

Annual emissions from plastic burning are estimated at 10,950 tons of CO2. Other emissions could be dioxin (from PVC based plastic), styrene, CO, particulate matter, and others depending on the composition of the plastic and the catalyst used during the manufacturing of plastics compounds

2.9 Emissions from Burning Used Motor Oil

Around 400 thousand motor vehicles of various engine capacities are operated in Kabul and based on interview with drivers, oil change workshops, and individual car owners, as an average, about 6-12 times per year the automobile oil is changed (at approximately 1000 km interval). Assuming conservatively that around 5 liters of oil is changed each time, at a minimum a total of 20 million liter of oil waste is generated in Kabul which all is burned for heating. It is clear that as a result of engine wear and tear toxic metals such as barium, lead, chromium, nickel, cadmium, and zinc is mixed with the engine oil and as a result of burning used motor oil, metal aerosols into the air are released that can contaminate the environment and impact human health. Assuming in the city of Kabul 30% of motor vehicles use diesel and 70% gasoline, the estimated emissions of toxic metals as a result of used oil burning into the atmosphere in below table.

Oil Type /Pollutants	Emissions t/y	Emissions T/day
Barium	0.165	0.0004
Cadmium	0.249	0.00068
Chromium	0.489	0.001
Lead	11.386	0.031
Nickel	0.099	0.0003
Zinc	163.548	0.448
CO2	52,724	144.447

2.10 Emissions Inventory (Total Emissions)

It is clear from the above discussions and calculations that motor vehicles make the greatest contribution to the emission of PM2.5 and ozone precursors (Tables 1-3) followed by tire, used motor oil, coal and wood burning. Sulfur dioxide is related to fuel quality while carbon monoxide, nitrogen dioxide and hydrocarbons arise mainly from vehicles 8 emissions. A similar finding was indicated by a study funded by the Asian Development Bank (ADB) but their inventory numbers differ from those from this study. The daily concentration of most chemicals emitted into the air is calculated based on 4084 Km2 area and 500 m thickness of the polluted layer. However, this approach is not a refined method, because different pollutants can segregate based on their vapor density and specific gravity. There is no safe limit for cancer causing chemicals such benzene, PCB's, dioxin, and others.

2.11 Health Effects of Air and Environmental Pollution in Kabul City

Air Pollutants	USA EPA Standard	Source	Health Effects on the Community
$PM_{2.5}$	24 hr 35 $\mu g/m^3$ Yearly 15 $\mu g/m^3$	Moving traffic, diesel auto exhaust, wood, tire, plastic burning	8% increase in overall mortality for each 10 $\mu g/m^3$ increase in $PM_{2.5}$ concentration in the air, death from respiratory illnesses cardiovascular diseases, and cancer, hospital admissions and emergency room visits, surgery for respiratory and cardiovascular conditions, hospital admissions due to asthma attacks, pneumonia, bronchitis and chronic, obstructive pulmonary disease, respiratory symptoms in both the lower and upper respiratory tract, decreased lung function. increased risk of premature births and infant mortality, pneumonia, neonatal mortality respiratory diseases and sudden infant death syndrome increased incidences of rhinitis, increased absenteeism and increased number of days of restricted activity (15) (16).
CO	1 hr 40 $\mu g/m^3$	Automobile tail pipe, wood, tire, and plastic burning electric generators	Affects the brain, cause changes in pulmonary and cardiac functions, headache, fatigue, sleepiness, respiratory problems, can form carboxyl hemoglobin and even can cause death (17).
Nitrogen Oxides	Annual 100 $\mu g/m^3$	Automobile exhausts, electric generators	Damage to upper respiratory system and lungs, lowers body resistance, reacts with water to form nitric acid in the eyes, respiratory system, and lungs (18).
SO_2	Annual	Automobil	Irritation of eyes, nose, throat and lungs, reacts with

Air Pollutants	USA EPA Standard	Source	Health Effects on the Community
	0.03 ppm	es, coal and wood burning	water to form sulfuric acid (19)
Ozone	8 hrs 0.12 ppm	Automobile emissions	Increased mortality, impaired lung function, increased asthma attacks in children, elderly, and sick(20).
Pb	3 month 1.5 µg/m^3	Automobile exhaust, tire burning, used motor oil burning	Learning disability, malformation of the fetes, severe brain defect in children, adverse reproductive effects in man (impotence), reduced sperm count and abnormal sperm, adverse reproductive effects and reduced fertility, still-birth, or miscarriage in women (2!).
Benzene	No safe level	Automobile exhaust, tire burning, used motor oil burning	Carcinogen and mutagen, causes anemia and leukemia (22).
Benzo(a)pyrene	No safe level	burning, wood, tail pipe emissions	Mutagen when metabolized, can cause cancer (23).
Dixon	No safe level	Burning PVC, tire burning, used motor oil burning	Human carcinogen causes chloracne a skin disease, lesions on the face and upper body, rashes, discoloration, and excessive body hair, cancer of fatty tissue and muscle (24).
PCBs	No safe level	Burning PVC, tire burning, used motor oil burning	Possible human carcinogen, can cause skin rash. liver cancer, low birth weight and brain damage in infants (25).
PAHs	No safe level	Combustion of wood and coal	Probable human carcinogen and mutagen, reacts with ozone to produce more potent compounds(26).
Cd	No safe level	Burning used oil	Carcinogen that causes kidney cancer (27).
Cr^{+6}	No safe level	Tire burning	Possible human carcinogen, mouth and nose cancer, skin irritation (28).

CHAPTER 03 – RESEARCH METHODOLOGY

3.1 Methodology

I will use the below approaches for making my research on "How to reduce Air and Environmental Pollution in Kabul city":

- Sampling
- Measurement Procedures
- Data Collection
- Data Analysis
- Limitations
- Qualitative Research Method
- Quantitative Research Method

3.2 Sampling Method

Several methods of survey circulation such as mail surveys, phone surveys, and electronic surveys were possible for this research project. After considering the advantages and disadvantages of each method, personal interviews survey and thesis questionnaire surveys were chosen as the medium to launch the survey. This method allows the survey to collect the overall information from individuals met on person and record the questionnaires filled by them.

3.3 Survey Method

The survey consisted of 29 possible questions in eight categories: (1) Respondent Information, (2) Responsible for the matter, (3) (4) Facts and Reasons behind matter, (5) Solutions, (6) Effectives of problem on public, (7) Best Practices.

The questions in the survey were formatted in three ways: i) multiple choice – single answer, ii) multiple choice – multiple answer, and iii) short written answer. The majority of questions were multiple choice. Seven questions were in the short answer category. Several multiple choice questions allowed respondents to check more than one answer if it applied; therefore, the sum of percentages may exceed 100%. Several of the multiple choice questions also allowed the respondent to answer "Other" and input a personal response in an answer box if the presented answers were not appropriate or sufficient. This method proved to be useful in that it allowed respondents to communicate their personal ideas and thoughts on a particular

subject while answering the survey. For some multiple choice questions, skip logics were added so that follow-up questions pertaining to the same subject would be displayed based on the response of the preceding question. Because of this, some respondents were not asked all 25 questions. This method was used so that respondent response time could be minimized.

3.4 Institutional Review of Survey

After the survey was developed, it was submitted to Dr. Noorudin Alavi for approval. He reviewed the questionnaire carefully and grant me approval to go ahead and collect the data required for my thesis proposal.

3.5 Distribution of Survey

To obtain a vast and diverse group of respondents, several Afghan governmental agencies including Kabul Municipality, Ministry of Urban Development, Ministry of Public Health, Ministry of Rural Rehabilitation, Ministry of Water and Energy, Brishna Company, Kabul Management Development Program were contacted in person, via phone and/or email in regards to circulating the survey to their members. Each organization was provided details about the research topic and the overall goal of conducting the survey.

3.6 – Personalities Interviewed for Research

1. OVER 200 PEOPLE INTERVIEWED.

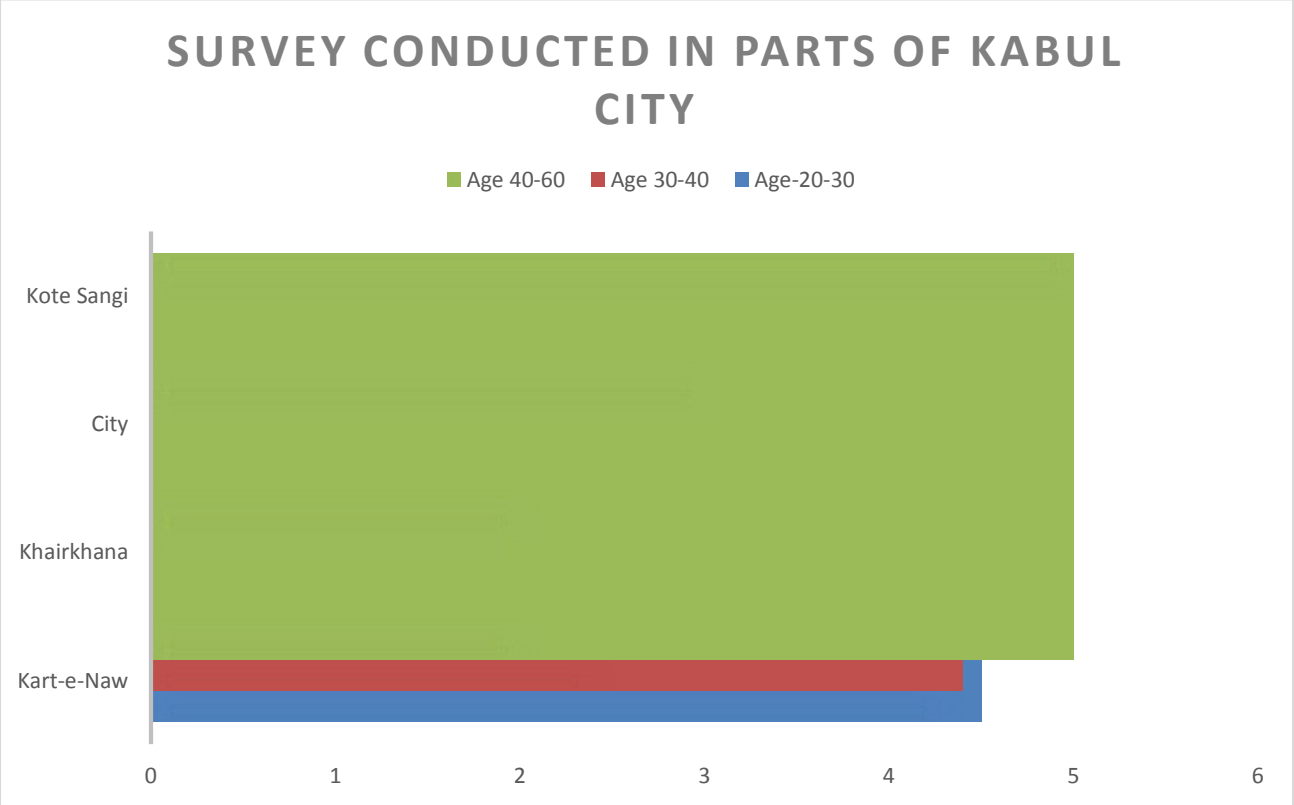
4. DATA ANALYSIS

4.1 Survey Results

The survey was given, submitted or delivered to over 120 governmental professionals and public elders, each having expertise in air and environmental control management and almost 80 individuals responded orally and 24 individuals responded with filled and signed survey questionnaires. All individuals responded were very professional and have had extensive knowledge about the air and environmental pollution matters in Kabul city.

4.2 Locations of Survey Conducted:

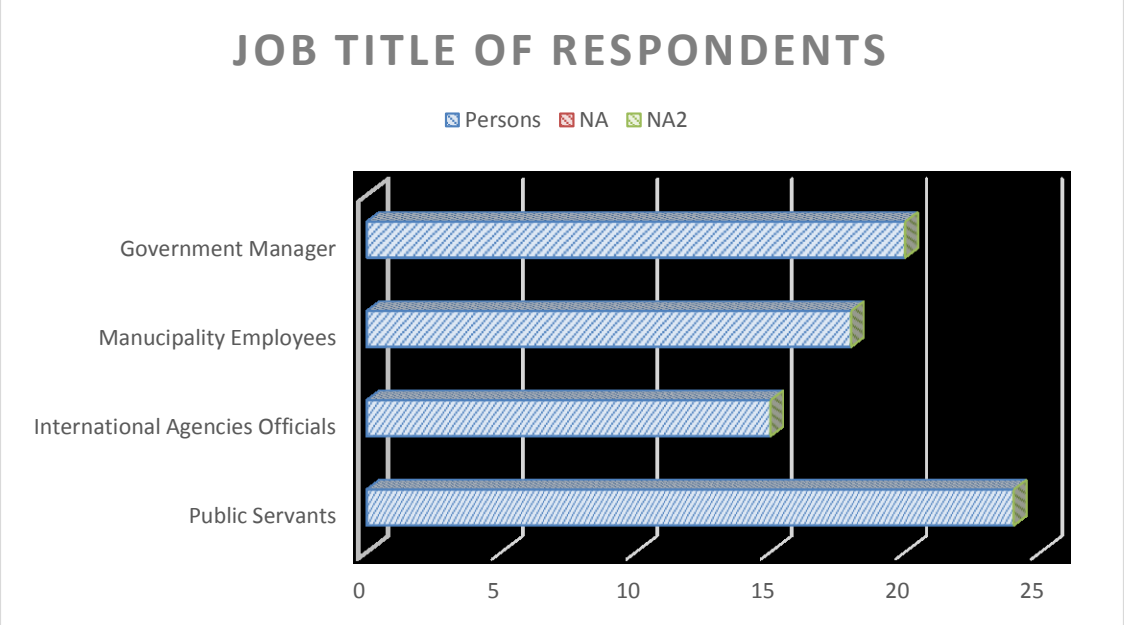
As shown in below chart this survey was conducted in several parts of Kabul city, the survey was conducted on base on population of people, rash of vehicles, manufacturing, roads measurement and other aspects that cause pollution in Kabul city.



4.3 Positions and Job Titles of Respondents.

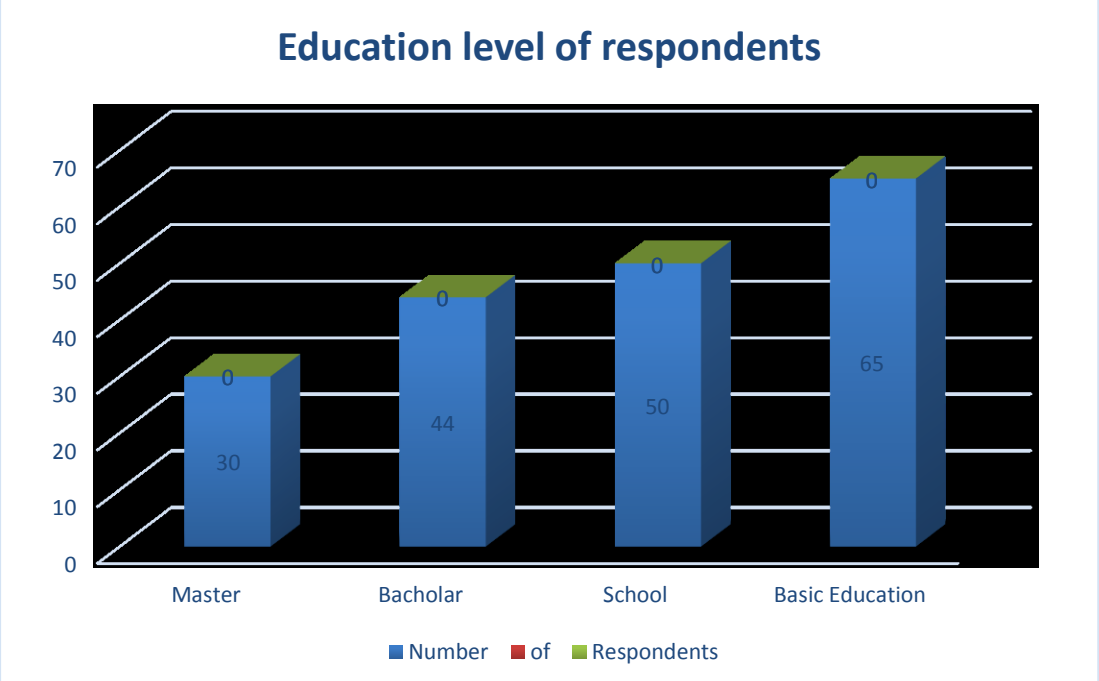
This survey was conducted with several governmental including ministry of rural rehabilitation, ministry of urban development, ministry of public health, Kabul Municipality and other agencies officials as show in below chart.

Majority of the individuals I have interviewed are very professional and well aware of the air and environmental problems in Kabul city.



4.4 Education Level of Respondents

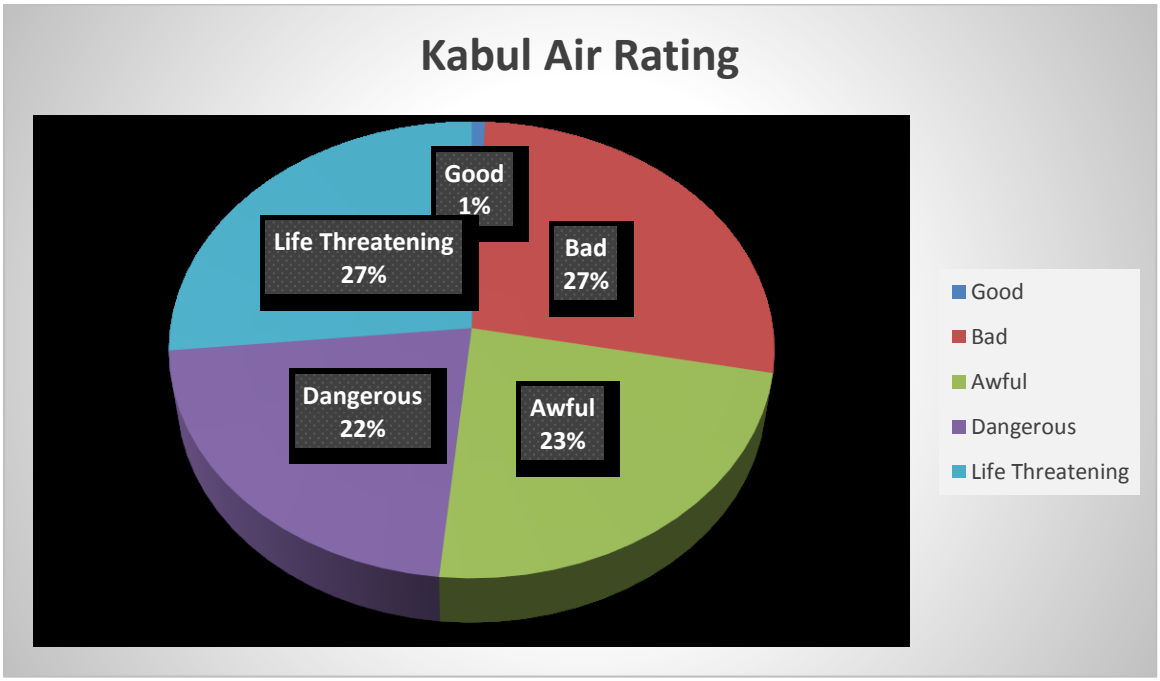
Everyone in Kabul city, either educated or non-educated can tell you lots of things about the risks and conditions of current air and environmental pollution in Kabul city but I have mainly focused on educated and well aware people, the interview included others as well.



4.5 Survey Questions Responses:

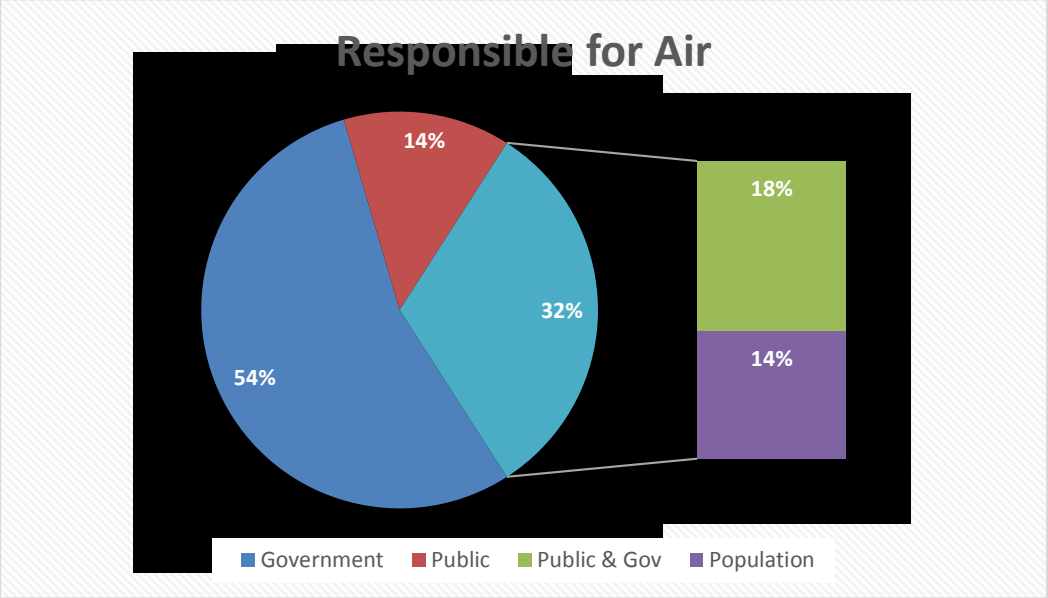
- How do you rate the current air and environment pollution in Kabul city?

Over 90% people in Kabul city feel sad and consider the current air and environmental pollution very dangerous, life threatening and not acceptable. The blame the government specially Kabul Municipality for its weak management, corruption and non-educated personnel.



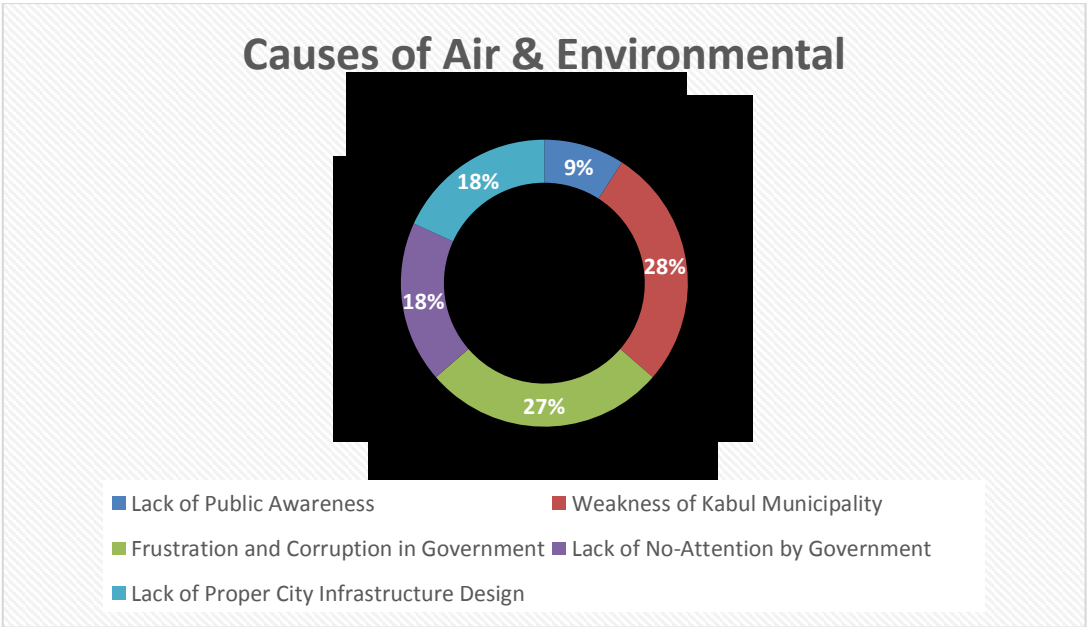
- Who is responsible for the current unclean air and environmental pollution in Kabul city?

People has different ideas and concepts about this questions but majority blame the government and its officials as representors to the public. They considered Kabul Municipality, Ministry of Urban Development and other relevant agencies completely fail to manage the city with proper standards. The assignment of wrong people, full engagement of municipality in public documentation only, no future plans, no current solutions, no emergency routes, no control on fuel, no control on gas, no control on import of vehicles, no use of technology and modern methods is result in no outputs. Therefore, the biggest concern is with the government comparing the responsibility with public and others. The government with its entities are mostly responsible to control the air and environment pollution.



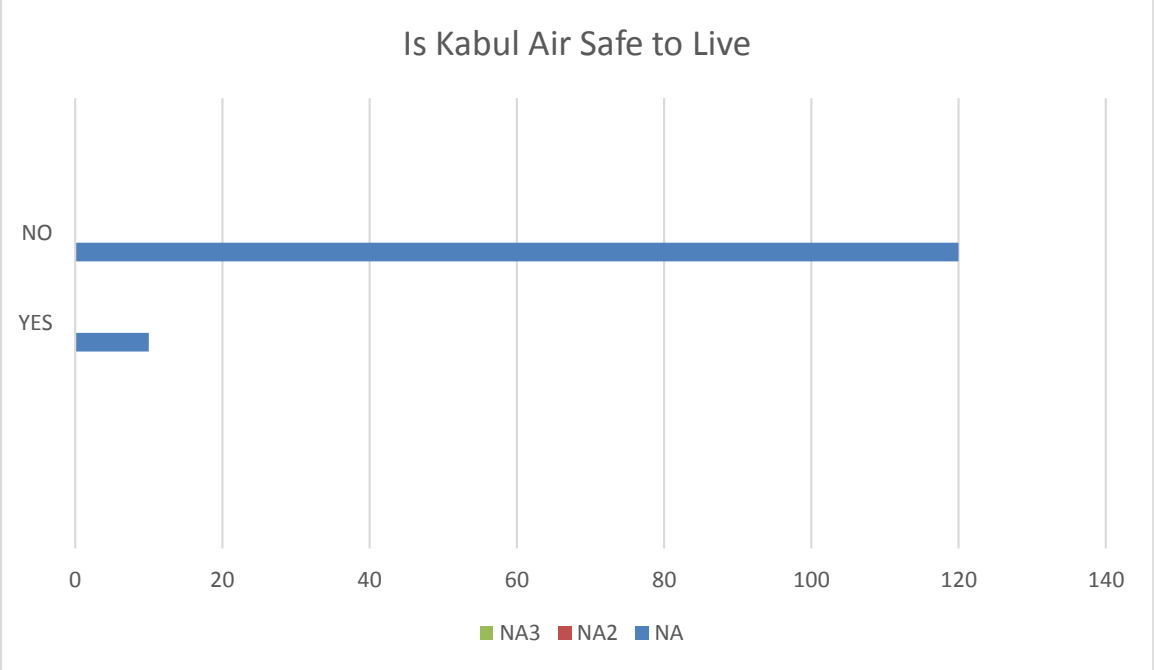
- **What is major source of causes of the air and environmental pollution in Kabul city?**

As shown in below figure there are several causes for air and environmental pollution in Kabul city including weak management of Kabul Municipality, Ministry of Health, Ministry of Transportation, Traffic Department, MOI and other agencies, beside to the government public awareness, lack of city infrastructure, corrupted governance and overload population are the main causes for air and environmental pollution in Kabul city.



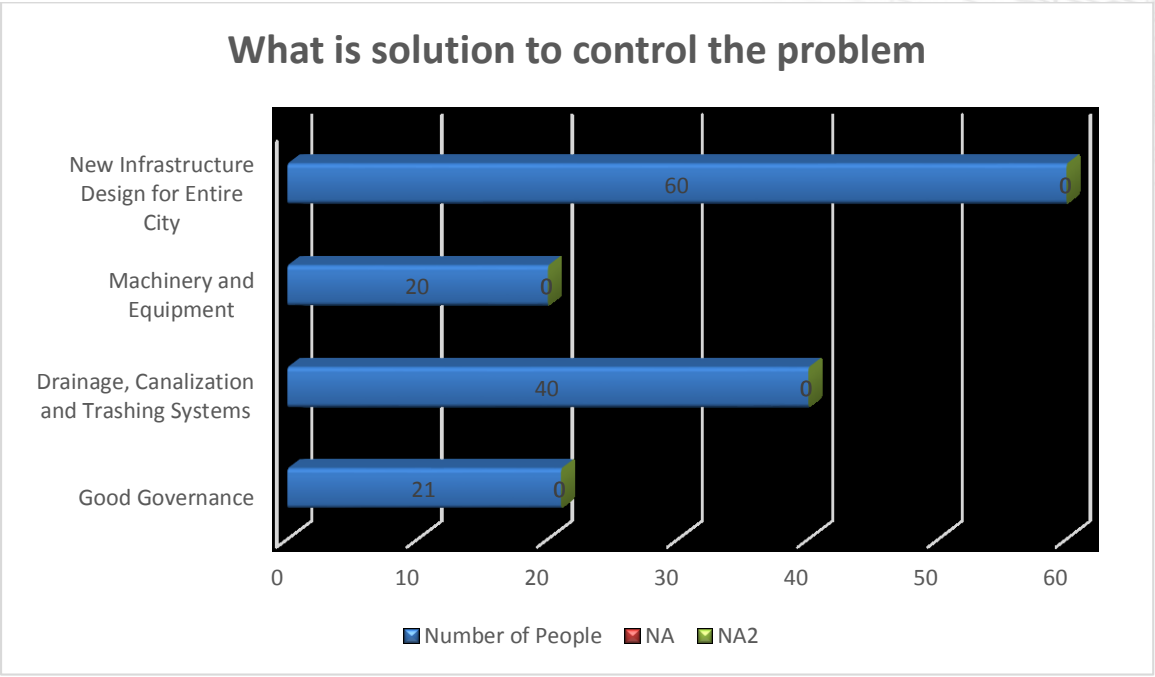
- **Is Kabul city really safe to live with current air and environmental pollution?**

Over 90% people in Kabul city consider air and environmental non-expectable and full of disease and sickness. The government should pay immediate attention and apply short and long term solutions to avoid increasing the risks.



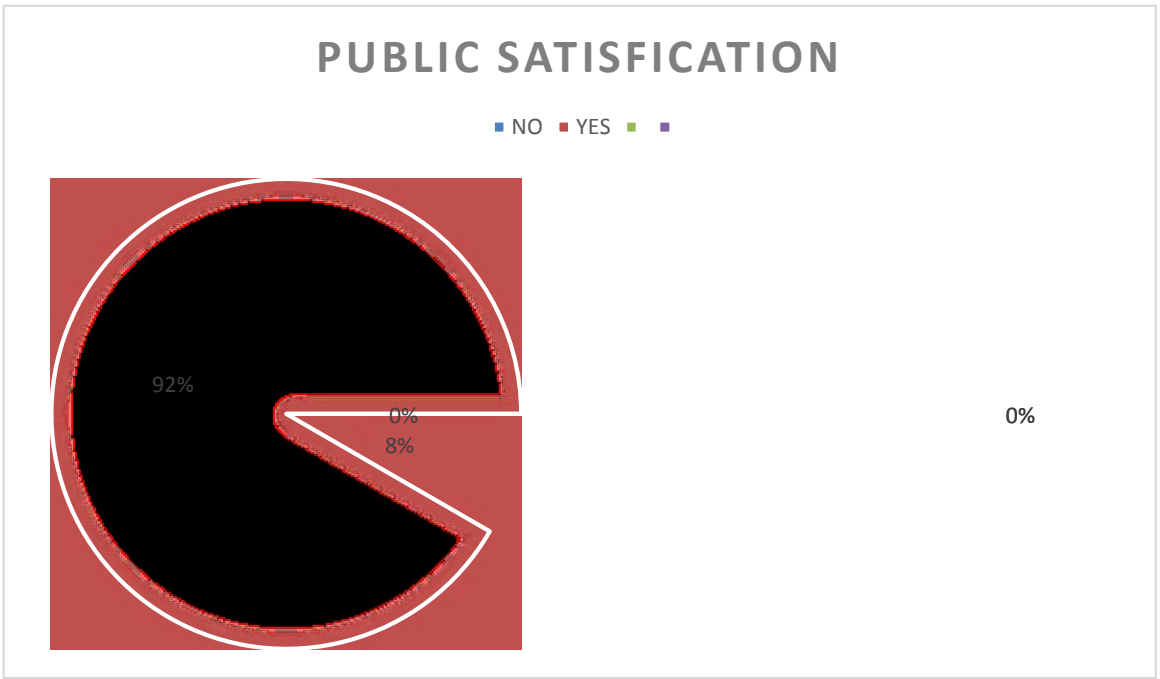
- **What we exactly need to sustain clean air and environment?**

Below in Recommendation and Solutions section, based on my four months research, conducting survey with government official, public and experts on air and environmental pollution I have given the overall conclusion, suggestions, recommendation and solutions for short and long terms to avoid further risks to the public health, increasing living standards and manage the city with the highest standards to provide maximum reliable, flexible and healthy services to the public. My major focus for short term solution is to privatize the air and environmental cleaning sector, increase capacity of Kabul Municipality, decrease non-educated personnel level in governmental agencies, appliance of technology and modernity in the overall city, spread public awareness, avoid import of useless cars, facilitate public transportation, encourage people for cycling and walk, control land management of Kabul city, built new master plans for every district, cultivation of trees, greenery and motivate farmers for agriculture business.



- **Are you satisfied with the current air and environmental management policies of government, does the government really provide acceptable services to public?**

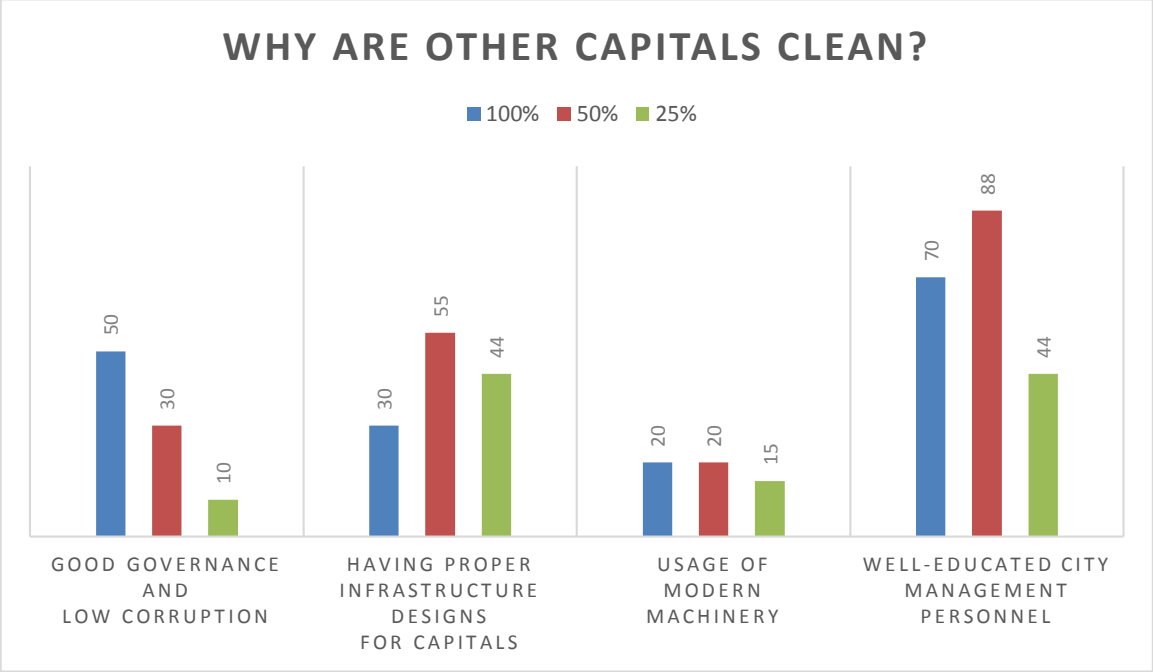
No one in Kabul city is satisfied with the current air and environmental management, even at far districts people are complaining about the weakness in the city management. 92% people are against the current management policies by Afghan government.



- **Why are other capitals very clean?**

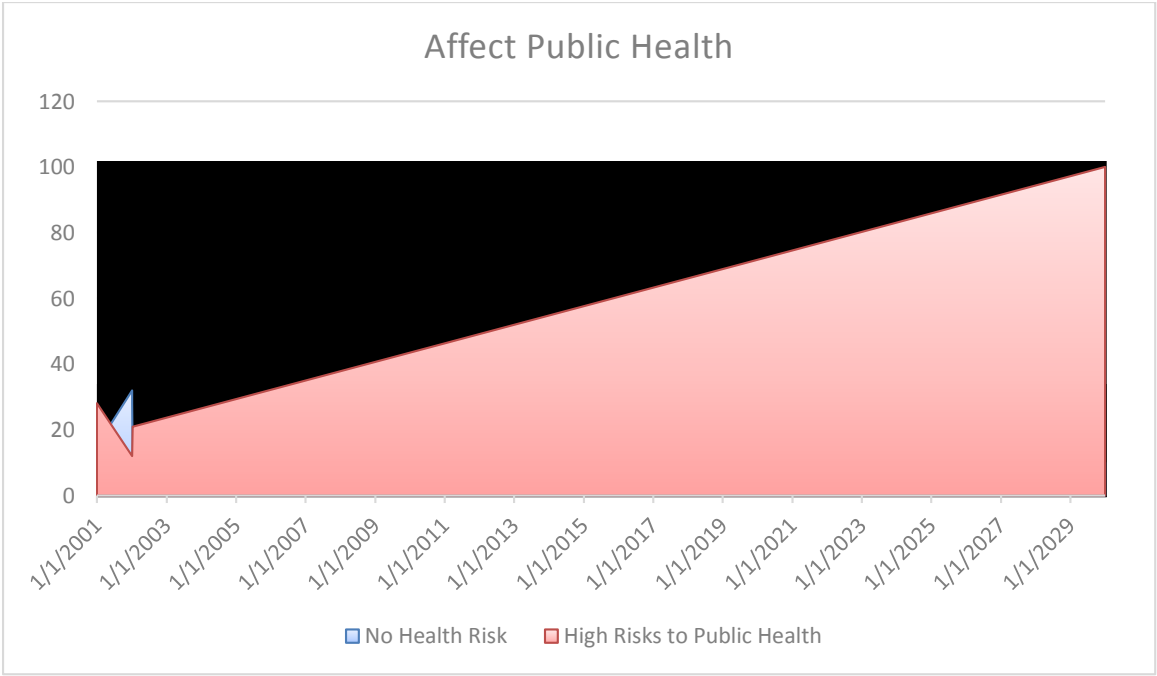
The overall result of answers for this question is that majority of capitals or cities are clean due to assignment of intelligent, qualified and technically expert personnel on governmental positions to provide public services, they practice below tips:

- Assignment of right people for in governmental agencies.
- Preparation and implementation of proper infrastructure city master plan.
- Engage overall ministries to control the air and environment.
- Public awareness through media.
- Plantation of Trees and Greenery
- Loyal and honest governmental representors.
- Usage of technology.
- Law implementation by everyone.
- Assignment of well-educated air and environmental planners in government.
- Recycle and reused cans and bottles, even the backs of paper.
- Post signs out in the gym or and anywhere is a bulletin where people look, and write things like recycle your cans, or reuse bottles, the message will eventually reach out to people.
- If you see any trash you can pick it up, or ask a friend to pick it up for you.
- NEVER litter.
- If you see someone littering, ask them nicely to pick it upon and stop, if they don't listen, then you pick it up yourself. (make sure you throw it out, or recycle)
- If you have an approval (I think you need one) pick some weeds maybe even trip some plants around the city to make it clean.
- Get a job moving laws so you can help make the place prettier, and make some green too. (LOL)
- Keep your own house clean, if you have a messy house and want a clean neighborhood that makes no sense.
- Import only new model vehicles.
- Avoid old machinery.
- Pave or concrete overall roads and streets.
- Do not allow non-master plan buildings and housing.



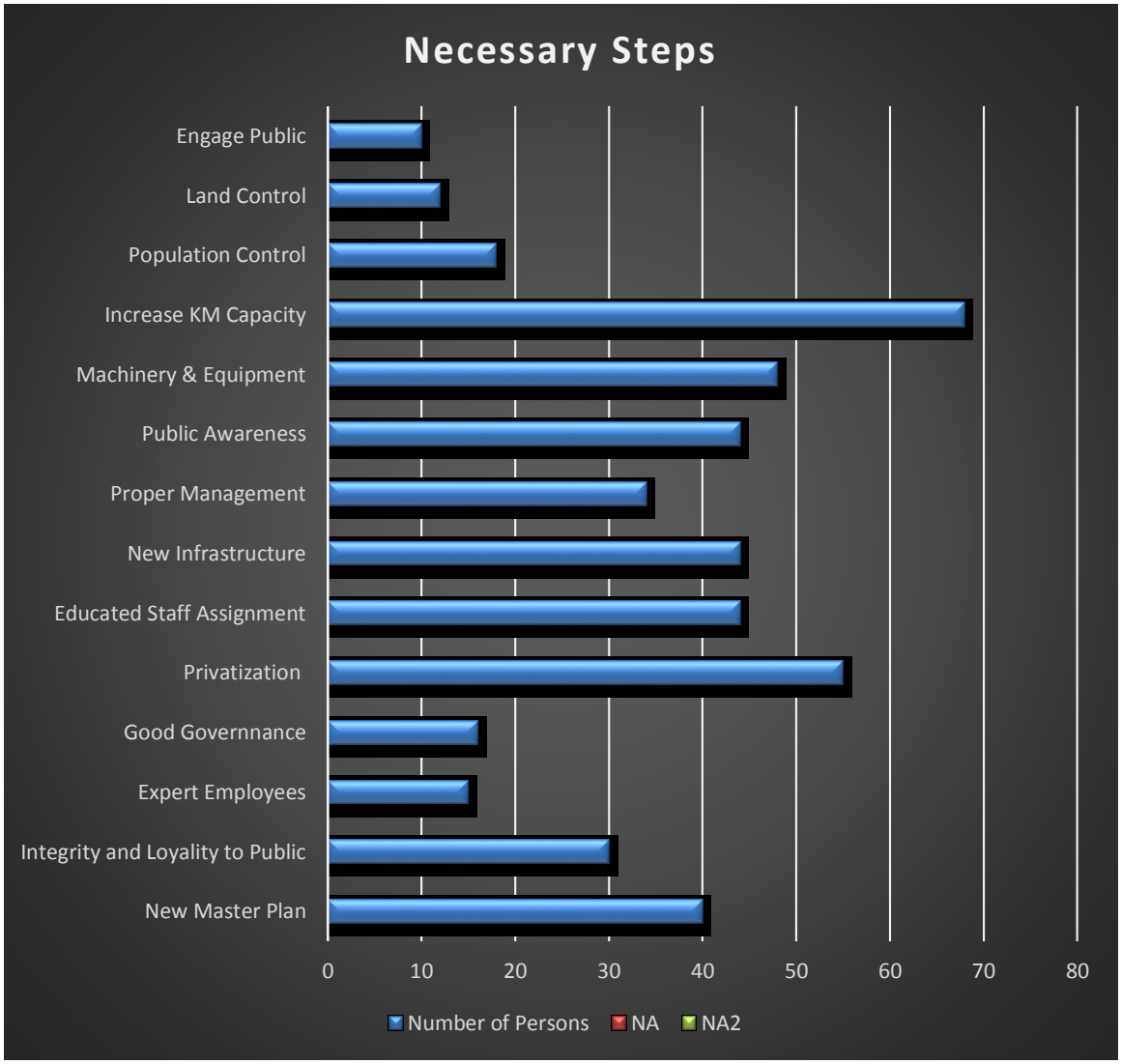
- **How does Air & Environmental Pollution affect health of public?**

The risk of air and environmental pollution is increasing on daily basis, since last 15 years there has been on proper plan implemented to avoid or decrease the risks affecting public health on daily basis. If the government don't pay immediate attention to this matter, the percentage of risks will go up as show in below figure.



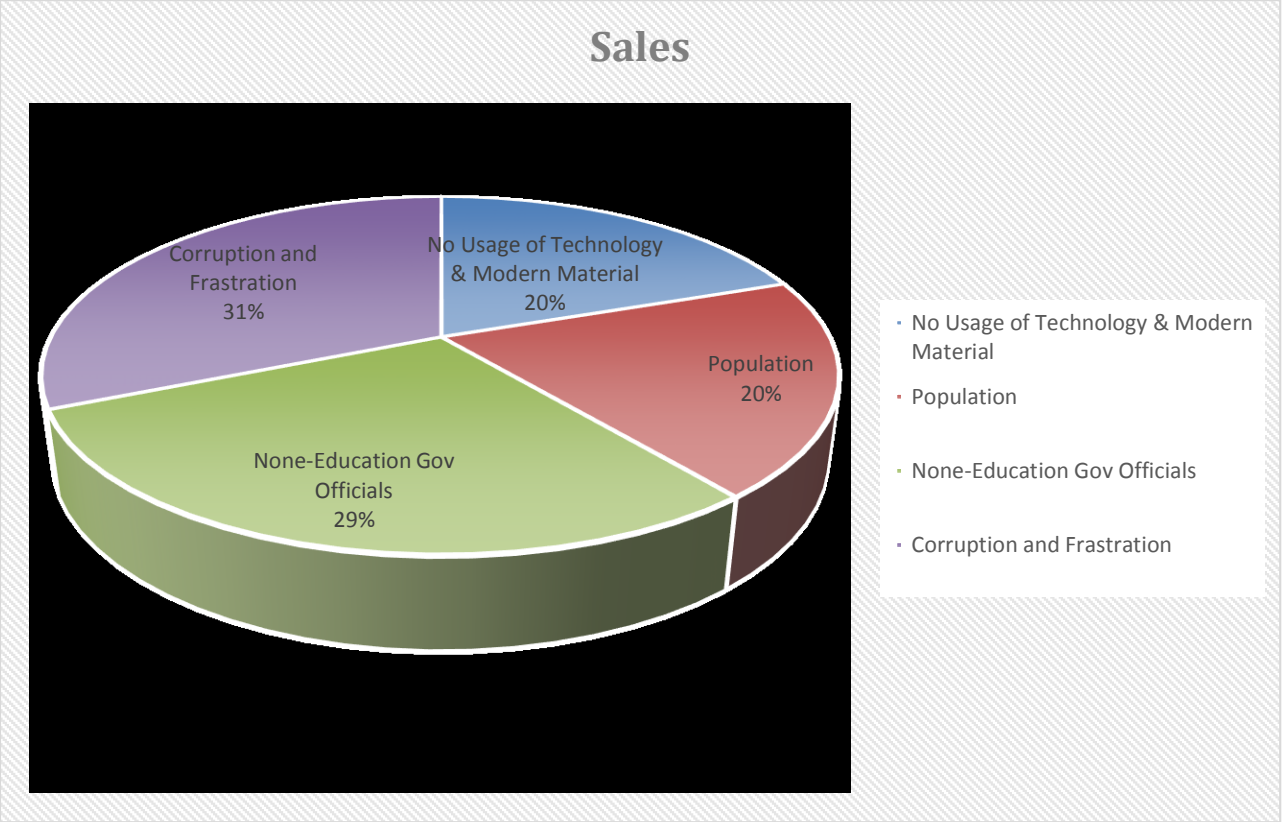
- **What does the government need to do to control the defects occur to public by Air and Environmental Pollution in Kabul city?**

Major of the responses I received from the overall survey respondents over 80% of individuals were requesting for good governance, educated and expert governmental officials, new and modern machinery, infrastructure plans and privatize the air and environmental cleaning issues. The considered the current policies failed, the government full in frustration and corruption. The current employees in Kabul Municipality and Ministry of Urban Development are very professional, they don't have proper education of city management, they were strongly requesting to replace the current employees with newly professional individuals who has international understanding of air and environment management in populated cities like Kabul.



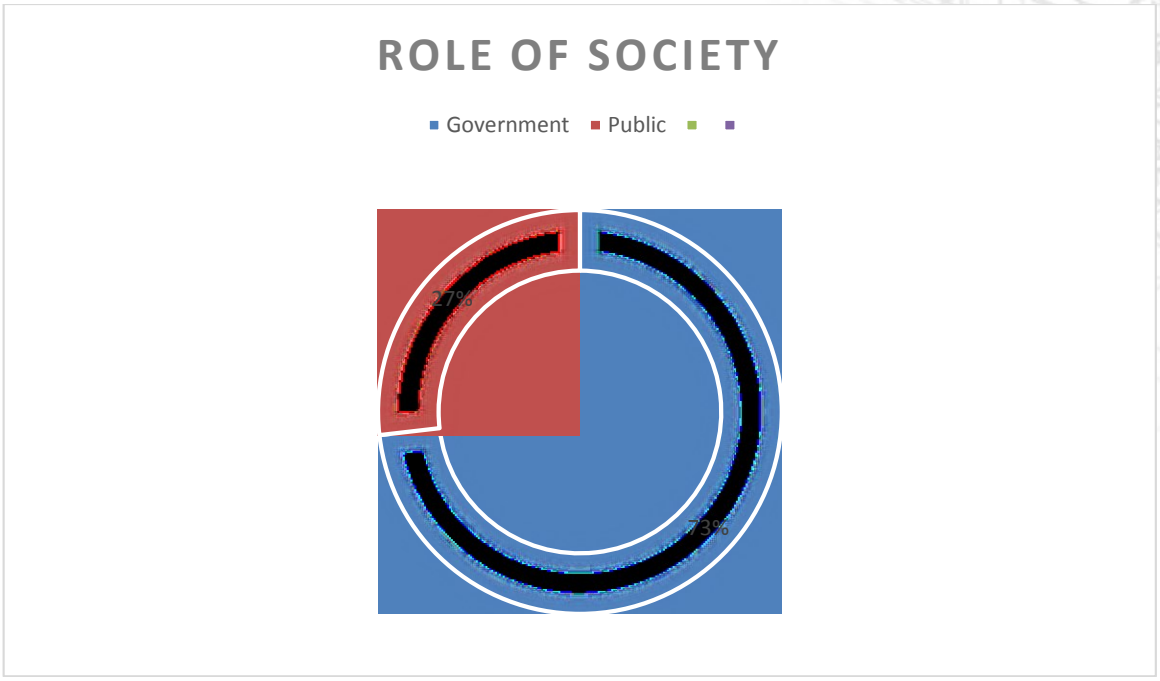
- What challenges do countries face, and what obstacles are preventing assistance in improving ambient air quality?

The challenges in Kabul city is no well-educated, expert and experienced personnel assignment on the air and environmental sectors of the government, as show in below figures 35% people believe corruption and frustration is the main challenge, 29% people pretend that non-educated personnel in governmental agencies, 20% no practice of technology, MHE and 20% believe population are the main obstacles improvement air and environmental quality in Kabul city.



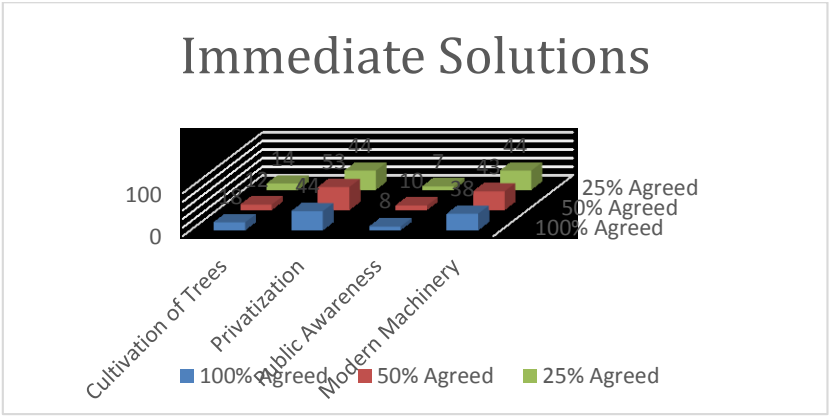
- What is the role of society in cleaning Kabul city?

In Kabul city 73% of 300 people I have asked this question believe government is very much responsible to control the air and environmental pollution with only 27% engagement of public, everyone believe Kabul municipality has extremely weak management, ministries don't control fuel, garbage, import of wrong material, no proper roads and streets. The role of public is to take care of governmental services, use them in proper and safe way, avoid distraction but if the government don't provide proper assistance, how/what can they assist.



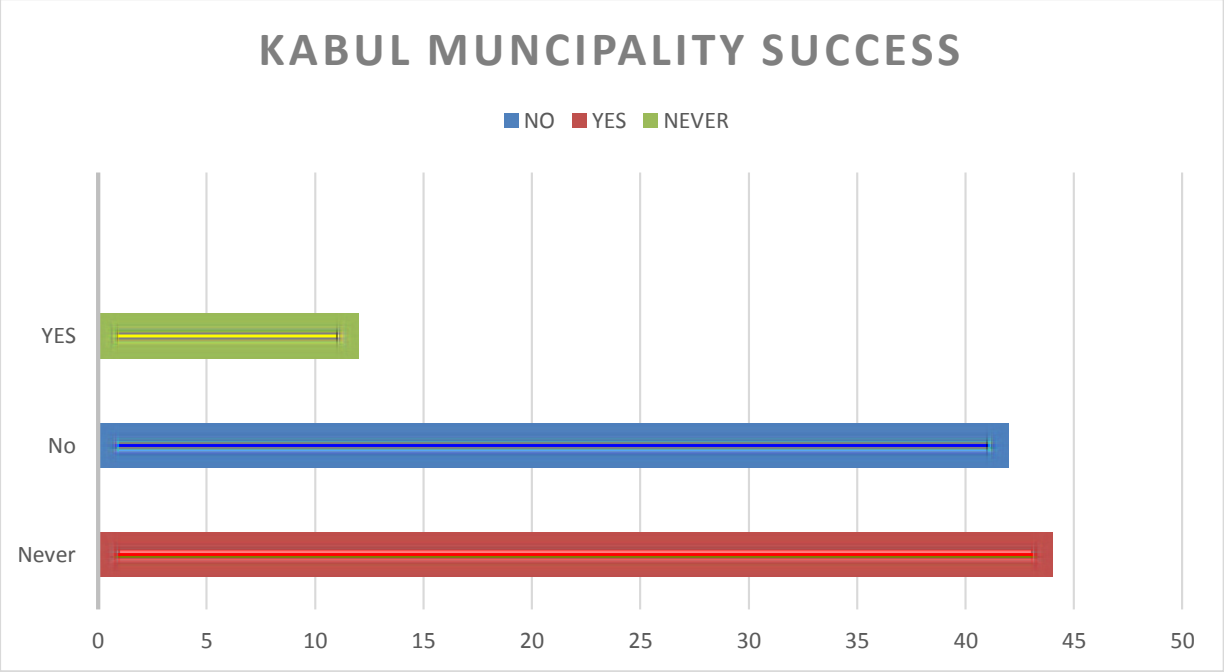
- **What is immediate solution to reduce air and environmental solution in Kabul city?**

Privatization is the only current and immediate solution to reduce the risks of air and environmental pollution to the public, the government should hire private contractors for each district for a specific period, the government should then purchase modern equipment and material, ,assign educated people, appliance of technology, make new city master plans, increase capacity of Kabul municipality, build new cities and towns in far districts of Kabul city, once everything is settled and government is fully ready for hand over to maintain the air and environmental pollution then it can suspend the contracts with private companies.



- Is Kabul municipality and other relevant agencies successful to keep the city clean?

Over 90% people I have met during my research they have considered Kabul Municipality and its entities fully failed to control the air and environment pollution in Kabul city.



5. BEST AND RECOMMENDED PRACTICES

5.1 Introduction

In the last 15 years' large number of international agencies, governmental sectors, private sectors have focused on how to reduce air and environmental pollution in Kabul city but majority of plans and theories have been failed due low management capacity, non-appliance of international standards in Kabul, no land management by government with other large number of reasons. Based on my technical review of the overall data available to resolve the matter I have strongly considered temporary and long term solutions for reduction of air and environmental pollution in Kabul city in below sections of this thesis proposal project.

5.2 Standard Solutions

The government should immediately assign qualified and experienced individuals on air and environmental control management entities within the government, approve proper 5 years

budget, privatize city cleaning management for temporary period. In today's world there are modern equipment and tools available for cleaning the air and environment in populated cities, the lack not using modern equipment by Afghan government made it very hard for public to breath easily and remain healthy from thousands of diseases that are spreadable from dirty environment.



Afghan government has to make an immediate global survey of modern equipment, tools, material and vehicles to be bought for city cleaning and public services.



At the minimum stage the government can practice cleaning methodologies, techniques from our neighborhood capitals with full appliance in Kabul city.

Air and environmental pureness is very much important than any other element of living in populated cities like Kabul, according to the research I have made, finally I determined the below multiple option solutions for immediate and long term solutions.

5.3 – Kabul Municipality and Ministry of Urban Development Weaknesses

Kabul Municipality and MOUD are the weakest governmental agencies to provide satisfactory services to the residents of Kabul city. Based on the non-valid and weak infrastructure of Kabul city, the assignment of Kabul mayor should be based on expertise, modernity, international experience and technical qualification. The Kabul mayor position should be openly and internationally announced for competence between technically qualified and experienced candidates, no matter from where the candidate is. The government should only determine and consider an individual for this highly valuable and public serving position who has excellent background to build new cities and keep the environment clean.

The Afghan government currently hires the Mayor from local citizens who has previous Kabul municipality experience past where none of the previous mayors have public satisfaction or maintain the city environment breathable except selling government lands, bribery, dealing in governmental contracts, frustration. There has been never a vision and mission to reduce the air pollution and keep the city clean, they never had a plan to stop plunder of governmental lands and they never provided master-planned lands to new coming residents from provinces of Afghanistan.

Kabul mayor is 90% busy with signing public and governmental application/documentation on daily basis, there has never been a computerized or online system for public services. The mayor has nothing to do with city development, city master plan and environment, its never observed.

The Ministry of Urban Development should be one of the busiest and full of opportunities governmental agency to have a massive role on expansion of current city development, establishment of new cities, residential and commercial buildings to the public. MOUD has been mostly failed with most of its projects due to the vast frustration and corruption between

the high level designees within the agency. MOUD can impact to reduce air and environmental pollution by providing new facilities to the local residents to live in their newly constructed cities which are built based on international standards and quality manner. MOUD can collect billions of U.S dollars by having proper selling plan for their projects.

5.4 – Immediate Solution for Kabul City

Kabul municipality has strong relationship with financial supporting agencies such as World Bank, UN, USAID, Embassies and international agencies to help them with any of their new proposal to keep the air and environmental clean. The best solution to prevent the ongoing life-threatening air pollution and environment Kabul municipality should immediately sign agreements with local and international private cleaning companies. Kabul municipality will require hiring of maximum 20 companies; one company can keep the entire district clean and breathable.

The value of each contract may be between $250,000 to $500,000 where Kabul municipality can easily get 1st year fund from one of the agencies listed above. To pay the contractors regularly KM can place proper taxation system on local residential and commercial locations to collect the amount on monthly basis. An example: If every single house pay 500 Afghani monthly to KM, multiply by 2,000,000.00 = 1,000,000,000 or equivalent $17,000,000.00 will net income on monthly basis. All figures are anticipated.

5.5 – Increase Capacity of Kabul Municipality

There are steps to take for increasing the capacity of Kabul municipality to reduce air and environmental pollution in Kabul city.

7.3.1 – Buy modern equipment and material for city cleaning, having 2,000 labors mostly aged over 50 will never be able to clean the city properly as required. The Kabul Municipality can easily talk with its donors to get fun for purchasing the below necessary items to clean the city.

7.3.2 – Hire expert and skilled employees, the government can easily handle to hire 15,000 local nationals to keep the city clean. Example: 15,000 X $200 (Monthly Salary) = $3,000,000. This option will only be applicable if the government can't accomplish 7.2 option or 7.3.1



Most easy ways to wash and clean the site walks, hand rails and road separating rails.

5.6 Low emission zones

Low Emission Zones (LEZs) are urban areas or roads where the most polluting vehicles are restricted from entering. This means that vehicles are banned, or in some cases charged, if they enter the LEZ when they do not comply with certain emission requirements. These requirements can be linked to compliance with Euro Standards or to other criteria such as the existence of a particulate filter or a catalytic converter. In Berlin, LEZs have been effective since 2008, and their emission standards requirements have become stricter in 2010. One year after entry into force, Berlin's emissions of diesel exhaust particulates had already decreased by one quarter and nitrogen oxide (NOx) emissions had fallen by 14%. In addition, LEZ requirements could be extended to off-road transport such as rail (diesel rail operations) and inland shipping.

5.7 Encourage bicycles and walking

It is important to ensure that cycling and walking are both safe and convenient means of transport. There are many ways of promoting cycling and the most important measure is to develop cycle paths and lanes. Where separate paths and lanes are not possible, traffic calming measures, such as 30km/hr speed limit, can play an important role in cycling safety. Extensive bike-parking facilities, especially at train and tram stations and bus stops, and bike sharing systems are also an effective way to encourage 'bikeand- ride' travelling. The feeling of safety is an important factor for the success of any walking or cycling policy and it can be achieved by giving cycling training to young children as well as training for car drivers, as has happened in the Netherlands, Germany and Denmark10.

5.8 Land use planning

Land use planning measures can also be considered to counter air pollution. Because their benefits are long term, land use and accessibility issues should be worked out in planning strategies right away so as not to further delay their positive impacts. The integration of air pollution and health considerations in land use planning should become systematic: reducing commuting distances and encouraging cycling and walking should become priorities. Air quality must be part of a more global strategy which aims at achieving clean and sustainable cities.

5.9 Congestion charges

A significant part of air pollution occurs when cars are stopped in traffic jams and reducing congestion is therefore a key action against air pollution. In addition, congestion pricing will also contribute to partly solve parking problems in cities. In Stockholm, where a congestion charge has been implemented since 2006, a significant decrease of traffic has been observed (traffic entering inner city dropped by 18%). Positive effects include reduction of air pollutants and CO2 emissions, fewer accident and road casualties, and decrease of exposure to air pollution. Moreover, the congestion tax generates revenues, which can be reinvested into the same locality, thereby increasing welfare. This makes congestion pricing arguably the most cost-effective measure to be taken locally.

5.10 Lower urban speed limits

In many European cities lowering urban speed limits has been put in place, leading to a significant reduction in emissions. In Stockholm, the majority of the roads are now limited to 30km/h and are accompanied by a strong communication strategy as well as enforcement measures. Establishing lower speed limits also includes other benefits such as making roads less hazardous and reducing noise, which in turn helps develop other transport modes such as cycling and walking. While the impact of low speed measures depends on enforcement and the compliance of drivers, its effects are immediate.

5.11 Restricting access to cars

Restricting car access to certain areas is useful for diverting traffic from areas with poor air quality. The effects on the restricted areas are substantial and immediate. Restrictions can be set on a permanent basis for specific streets, pedestrian residential areas for example, or temporarily such as in the case of pollution alerts or during certain times of day.

5.12 Parking management

Regulating and limiting the number of available parking spaces is an effective means to encouraging use of other modes of transport in various cities. Paris, Copenhagen and Zurich have recently modernized their parking policy by decreasing the number of public parking spaces and by turning free parking places into paid ones or increase existing fees. These measures have the effect to reduce commuter car traffic. In Copenhagen, new parking spaces were created underground for residents while the city closed on-road parking spaces, hence improving urban space and urban environment. In addition to its deterrent effects, parking management can also include economic incentives, such as in Amsterdam where owners of cleaner cars benefit from reduced parking fees.

5.13 Public procurement

Reducing the environmental impact of vehicle traffic can also be achieved through green public procurement. In Copenhagen, all vehicles within the municipal fleet are required to meet low emission zones' requirements and from 1st January 2011 onwards all passenger cars bought by the city of Copenhagen will need to be either electric or hydrogen cars. In Berlin, new diesel cars must have diesel particulate filters, and buses have been equipped with diesel particulate filters for ten years. Provisions on public procurement could also apply to construction

machines that are used in the framework of a public contract. Similar to Euro standards for vehicles, the Directive 97/68/EC creates emissions categories for these engines which could be used as a basis for selecting the best technologies (vehicles retrofitted with particle filters and NOx abatement technologies, etc.).

5.14 Car-sharing

Car-sharing is used to fill the gap created when public transport, cycling or walking are inadequate or unavailable. It is a mobility service which allows the use of one vehicle by different users registered in advance with an operator that manages the fleet of vehicles. In Lyon, the car sharing system has been recently developed and offers low prices for individuals and companies13.

5.15 Improving public transport

Measures to increase the attractiveness of public transport should be implemented as a package including aspects of availability, accessibility, reliability, pricing, safety, and comfort. To increase speed and reliability, innovative strategies involving coordination of traffic light signals could be employed to ease the bus flows through city centres. In Glasgow, GPS signals relaying the location of buses can be compared with the actual timetable and if necessary traffic signals can be pre-empted in order to allow buses to continue on their journey more quickly. Traffic light detection systems are a similar strategy currently being trialed in Lyon.

5.16 Park and ride

Schemes Establishing park and ride schemes can be efficient in relieving sensitive city centers but depends on the quality of public transport. Their success relies on the difference in travel times and costs between a car trip and a combined car public transport trip. In Vienna, parking facilities on the outskirts of the city have been established and makes it easy to change from individual car to public transportation (such as underground, street car or bus).

5.17 Promoting electro

Mobility The promotion of low-emission vehicles such as electric vehicles as a replacement of conventional cars is also an important measure to reduce air pollution in city centers. Various actions can be taken by cities to promote electro mobility. It is particularly important for local authorities to ensure that charging points for electric vehicles are easily accessible. Some cities are also exploring the possibility to equip their car-sharing system with low emissions vehicles.

Look for cities with similar problems and their ways of handling them and get involved in networking and exchanging ideas on good practices.

• Communicate the benefits, cost effectiveness and positive impacts of different measures. Stress that they will help improves the quality of life in your city and save money.

6. DISCUSSION / FINDINGS

The findings reported from a comprehensive survey of how to reduce air and environmental pollution in Kabul city conducted in a period of four months throughout the entire districts, governmental entities, international agencies and public a summary of the survey is:

NEPA has said Kabul has the most polluted air and dirty living environment among neighboring capitals and one of the worst in the region. "The air in Kabul is two to three times more polluted than cities in the neighboring and Central Asian countries. Two to three persons in each family are suffering from various diseases caused as a result of polluted air, the residents complained, demanding the relevant departments to address the problem.

Kabul has turned into a center of old vehicles and the use of substandard fuel is prevalent, that the use of big generators by aid organizations and international forces were also contributing to air pollution, especially in Kabul. Burning fossil fuels like coal and also wood-burning in winter, lack of public awareness, weak management of Kabul municipality and other relevant entities, no land management by government, no privatization, no use of technology and modern equipment, non-educated personnel in governmental entities, no loyalty of officials to country, lack of knowledge, weak city infrastructure and corruption in government are considered the main sources of air pollution.

Lack of green zones and the loss of trees and forests resulting from recurrent drought and/or widespread deforestation have further exacerbated the situation. In the past [before 1979] we had over 14 million hectares of forests and greenery in the country. Now it is less than one million hectares.

Afghanistan imports 5,000-6,000 tons of fuel every day but there is little or no supervision of its quality, according to the government. "Two or three days ago, we impounded 400 tonnes of bad quality fuel. The annual growth rate of urban population of Afghanistan is amongst the highest in the world with 3.97% (2010 - 2015 estimate) If this trend continues, the country will face significant pressures and increase on air and environmental pollution.

6. – CONCLUSION / DISCUSSION / FINDINGS

Kabul was known for its clear air and spectacular views of snow-capped Mountains even in the 1980s. Today, the city's mountains are only rarely visible due to very severe deterioration of ambient air by pollutants, specially, suspended particulates and ozone which are caused by cutting trees, increased number of gas guzzling and smoking old vehicles driven on severely dusty roads and sidewalks, population increase, low quality fuel, burning scrap tires, plastic, used motor oil, wood, and coal, intense sunlight promoting photochemical reactions, low humidity levels, and lack of environmental responsibility and oversight . The number of motorized vehicles is now reaching almost one million in the city. Increased demand for purchase of personal vehicles is triggered by concentrations of wealth through legal and illegal means, money laundering and enhanced employment opportunities in Afghanistan, population boom from 300,000 in 1977 to roughly 5 million today. The city sits in a basin 1800 meters above sea level, and 10 is surrounded by mountains that rise two to three kilometers or more above the basin.

High elevation and intense sunlight trigger ozone formation. In addition, due to inversion, air pollution is generally worse in the winter, when thermal inversions are more common. Factors such as the indifference attitude of the public and private interests, corruption, indulgence of having big cars, have obstructed the fight against air pollution. In light of the latest election, the international community and the government should realize that the worst enemy of Afghanistan is air pollution, not the Taliban. It is the lead in the environment that poisons the brains of the Afghan children living in urban sprawls and reduces their learning ability and other air pollutants that are threatening the public health every day killing many citizens every day.

7. RECOMMENDATIONS

7.1 Recommendations

In contrast to many other big cities of the world, Kabul has not made any major effort to reduce air pollution. Recognizing that transportation is a major pollution source in Kabul, any strategy that geared to reduce or control atmospheric pollution has to include a transportation improvement program. The main programs to combat air pollution in the Kabul that need to be considered but not limited to include:

1. Transportation improvements

a. control the number of private cars

b. prohibits the import of old cars,

c. imposes high tax on gas guzzlers,

d. promotes public transportation,

e. encourages carpooling and telecommuting

f. strictly controls quality of imported fuels, promote the use of low sulfur diesel,

g. Introduce the use of catalytic convertors to reduce exhaust emissions

h. control engine conditions. Since incomplete combustion in old or poorly maintained engines is a direct cause of carbon monoxide and unburned hydrocarbon emissions, the enforcement of engine maintenance standards should be another goal of traffic. The major compulsory program implemented in this direction in other countries for example the United Sates is called the Inspection and Maintenance Program. It is a costly program, however, in Kabul this process can be simplified by authorizing traffic inspectors to stop smoking vehicles until they have been repaired and do not smoke any longer. Reduction of lead and sulfur in fuels and finally the introduction of catalytic converters will drastically reduce pollution.

2. intensify pavement of dirt roads,

3. populate the dusty roads, vacant areas, and parking lots by those trees and shrubs that are native to the area this should significantly reduce emissions of dust by traffic and winds.

4. prohibiting the burning of scrap tires, used motor oil and plastic (impose a bounty on plastic bags, for example, 2 afs/bag.) will result in better air quality for the people of Afghanistan.

5. pass legislation to obligate the mass media to launch extensive environmental campaign on pollution prevention topics for free. After all, they make money by using public air space.

6. Institute a dynamic program in schools of the country at all levels and educate the future generation of the country on the health effects of air pollution and pollution prevention, conservation, and recycling.

- Solid Waste Management is highly required.
- Control on fuel import is very highly necessary.
- Kabul city should have a new master-plan in next 15 years.
- Government should pay full attention and clean public facilities, infrastructures, roadways, stations, canalization systems, waste management and disposal on daily basis with modern technology.
- Commercial media campaigns by the government for society to reduce the air and environmental pollutions.
- Publish new rules and regulations for societies to clean up their home-around environments.
- Construction and Rehabilitation of Public Latrine and Private Latrine.
- There is a strong need to have an integrated approach to collect separately and dispose waste from clinics and organic waste.
- More than 2,400 bakeries in the city use wooden stoves, and typically around such installations soot-ridden smoke billows into the air.

7.2 ACTIONS REQUIRED:

- Solid Waste Management
- Liquid Waste Collection and Disposal
- Public septic tanks
- Side Ditches Drainage and road Improvement (cleaning and recons.)
- Removal of Vagrant and Mad dogs: Treatment of Latrines (filling the pits with soil and gravel, spraying insecticide chemicals)
- Construction and Rehabilitation of Public Latrine and Private Latrine:
- Specific waste, produced by industries, hospitals, and destruction/construction debris, has dramatically increased the volume of waste;
- This mixed waste collection results in health hazards;
- There is a strong need to have an integrated approach to collect separately and dispose waste from clinics and organic waste;
- More than 2,400 bakeries in the city use wooden stoves, and typically around such installations soot-ridden smoke billows into the air;
- For immediate solutions, Kabul municipality should sign agreements with local environmental cleaning companies; one company should be contracted for every district in Kabul.

- Kabul municipality should process immediate taxation on every single planned and non-planned home in Kabul city; they should at-least pay 500 a month to support Kabul municipality's financial strength to improve the capacity of air and environmental control. 100,000 homes X 500 = 500,000,000.00 Afs
- Built metro and railways for local transports around the Kabul city
- Expand public transportation roads
- Proper taxation on public marketing boards
- Construction new residential cities
- Construction new commercial towns
- Build proper sewer canalization system in every district
- Hire enough personnel to help and keep the environment for living.
- Role of Public to keep the environment clean
- Make complete air quality information easily available to the public.
- Tighten the controls for power plant emissions to reduce emissions.
- Introducing cleaner fuel standards and switching to electric vehicles.
- Restrict the construction of power plants and other energy-intensive industries near residential areas.
- Improve urban planning to increase green spaces.
- Take air quality into consideration when conducting environmental assessments for major projects; for example, flyovers and highways should be far away from residential areas.

7.3 More Ways Forward

Sustainable development of urban areas requires a balanced approach based on economic, social, and environmental criteria. An integrated analytical framework is needed to analyze the links between unsustainable urban development and vulnerability to the cities like Kabul.

- The decision support system in terms of monitoring of the environmental qualities, and assessment of the impact of pollution on human health and economy can only create political will to deal with the urban environmental challenges with maximum communities' participation.
- Afghanistan need to learn from the experiences of other countries and as a least developed country should explore the financial mechanisms available to develop infrastructures and transfer of environmentally sound technologies to address the urban environmental challenges.

- As environmental legal system and the economic policies of the country need to be equipped with sufficient economic instruments to promote cleaner technologies and behaviors.

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